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Interpreting Costs

There are two sorts of foundries, the one is a complete entity and the other a department of a larger establishment. In the first case, the installation of plant or a process which is designed solely to improve quality, may increase costs and the only means of recovering these is by an enhanced price paid by the customer. Thus salesmanship enters very largely into the question, as the buyer must be convinced that the enhanced prices are justified and even offset by the economies that can be expected from the use of castings of higher quality.

The case of the department is exactly the same, but here the foundry manager has to be his own salesman. Failing this, he is likely to be faced with the awkward statement that whilst the machine-shop manager has reduced his costs, those of the foundry are higher—and for such a state of affairs he ought to be ashamed of himself! It thus behoves both the foundry owner and the departmental manager to clarify the position with the customer or the directors of the firm (as the case may be) before embarking on innovations designed to help the user. The former can do this by a circular letter to his customers, interesting them in the innovation, perhaps by an invitation to the foundry to see an experimental plant and thus securing their co-operation in the early stages. The departmental manager will effect the same end by making a report to his directors and asking them for a statement as to existing costs of machining or maybe enamelling for various castings before and after the installation of a new process, and at the same time stressing the overall effect on the cost of the finished article.

Costs, like statistics, are capable of varying interpretations and it is this, as we have good reason to know, which can act adversely on a department of a large works. One foundry manager pointed out that he could make his costs look much more favourable in the eyes of the cost accountants by setting on more men! Yet the system looked logical on paper. By and large, we are not satisfied that the costing of the foundry departments of big works is correct, for their managers have compared their production per man hour with that of the custom foundries, and, finding them in every way comparative, if not actually more economical, fail to understand their inability to compete commercially. The difference can usually be associated with "overheads," and in this direction, despite much logic, no cost accountant can ever allow himself to reduce those placed on the foundry department. Foundry managers, to be successful, require many attributes, not the least of which is salesmanship in all its aspects. When he has but one big customer—another department—a manager must solve this question of his apparently higher costs and sell it to his colleagues. It may be that if a big works closed its foundry department and bought in the open market, the overheads previously borne by that section when transferred to the rest of the departments would make a big hole in the credit side of the balance sheet and give some indication that, after all, the foundry department *was* something more than a convenience.

Parents' Day at B.T.H.

Parents of apprentices who are being trained at the Rugby works of the British Thomson-Houston Company, Limited, on Saturday visited the company to see something of the training and facilities afforded to their sons and daughters. In the morning they went to the Rugby College of Technology and Arts, where the apprentices receive part-time education complementary to their practical training with the company, and in the afternoon toured the works, including some of the training departments, and inspected the social amenities provided for the trainees.

After tea at Coton House, the apprentices' main residence, the principal guest, Sir Hamish MacLaren, Director of Electrical Engineering at the Admiralty and a former B.T.H. apprentice, addressed the apprentices. He advised them to do whatever they were set to do and let the future take care of itself—their futures were assured. He warned them, however, not to neglect the social side of life and asked them to avail themselves of the facilities which Coton House offered and the advantages of communal life.

The day's events concluded with a display of fire-fighting by the Coton House brigade, which is comprised of specially-trained apprentices in residence.

The accompany illustration, taken from a recent photograph, shows the progress being made in the erection of the new offices of the FOUNDRY TRADE JOURNAL *and its associated publications on the corner site of* 17 *and* 19, *John Adam Street, and* 1, *York Buildings, in the Adelphi, London, W.C.*2. *It is expected that the move to these new premises will take place in the late Autumn of this year.*

Prevention is better than Cure

Each year in industry there is an average of 700,000 accidents—three times the number of road accidents—but relatively little is done in the way of safety campaigns, and every year £14,000,000 is lost in wages to the workers, apart from the more important factor of the suffering, the disability, the worries, and the fears of the injured man and his family. These disturbing points were put before a health conference in Edinburgh last month by Dr. D. G. Evans, assistant general secretary of the Medical Practitioners' Union.

The conference, organized by the Socialist Medical Association, passed a resolution expressing its concern at the inadequate provision of occupational health services for workers and "the unnecessary wastage of life, health, and working power associated with conditions of work in factories, mines, and other places of employment."

Dr. Evans said there should be an immediate increase in the staff administering the Factory Acts, and the existing provisions should be drastically tightened up. In all factories there should be more control over the first-aid system and, where there were more than 250 workers, a State-registered nurse should be employed. The need for an occupational health service could be gauged from the fact that between 1948 and 1951, 20,000 miners were registered as suffering from silicosis, declared Dr. Evans. Once the registration stage was reached, the disease could not be cured.

Incentives

Birmingham University is carrying out research into incentives Professor P. Sargant Florence, Dean of the Faculty of Commerce, revealed on May 3 when he spoke on "Principles of Remuneration" at a study course arranged by the University and the Institute of Personnel Management at the Institute for Engineering Production, Birmingham.

In recent years, he said, psychologists and so-called industrial sociologists had thrown "an awful lot of dust in people's eyes" on the subject of incentives. As a result, the educated classes now firmly believed that financial incentives were no good. This was "absolute rubbish." Incentives were still the main way of getting increased productivity.

Incentives could often be used to make slack workers into good ones, but a difficult problem arose when piece workers, who were already working well, were given a more efficient machine. If the rate were cut the man would complain; but if he were on a time rate he probably would not complain. It was his experience that some highly advanced employers—such as Ford in America, had gone back to time rates. The Fawley refinery was built with time-rated labour and the trade unions had been very interested in that job.

Old Cannon Balls Required

The Editor of the magazine of the Stanton Ironworks Company group has asked for the whereabouts of any old cannon balls made at the Riddings Works so that one can be preserved. The Riddings Ironworks have the date 1802 on the first foundation stone on the site, and other buildings have stones with the dates 1817 and 1824. Shot and shell was made by the works for the Crimea War. Relics of this were often used as door-stops or weights, but in the last war most of these relics were collected in scrap drives. A few, however, are thought to remain, and the editor is looking for an old cannon ball for preservation.

Steelmaking for the Steel Foundry*

By J. Blackburn, A.I.M.

Dealing first with the changing aspects of the steel castings industry, the Author passes to consider the melting section as a service department of the foundry and closely integrated with it. Next, the various types of melting unit available to the steelfounder are described in detail, and advantages and disadvantages peculiar to each are quoted. Individual processes too are reviewed at length. Finally, such procedures as temperature measurement and control and pouring methods are surveyed.

Introduction

In the early days of the steel foundry industry, a buyer asking for " steel castings " was supplied with castings in carbon steel whose composition was left to the judgment of the founder. Such castings were usually in the 0.30 to 0.80 per cent. carbon range, depending on the manufacturing process, and since steel castings were looked upon with some suspicion by engineers, were generally only moderately stressed in service. As the art of making steel castings improved, and they came to be more widely used, the larger buyers such as the railway companies and Government departments began to introduce specifications stipulating composition and physical properties of castings. From that time until the present day the tendency has been to increase the number, and widen the scope of such specifications, so that nowadays there exists a vast number of them, some issued by the British Standards Institution and similar bodies in this country and abroad, and many evolved by individual companies.

In recent years there has been a big increase in the use of hardened and tempered low alloy steels for castings, and specifications exist for nearly all varieties with tensile strengths ranging up to 80 tons per sq. in. Such specifications place an extra burden on the shoulders of the steelmaker for two reasons. First, the fact that when a designer specifies a steel of high tensile strength one can assume that he is going to use the physical properties listed in the specification as bases of design, so that uniformly high quality must be obtained in manufacture. The fact that two of the high tensile specifications, D.T.D. 666 and D.T.D. 705, cover steel castings for aircraft structural components illustrates this point. Aircraft designers are accustomed to using their materials to the utmost of their strength, with much smaller factors of safety than mechanical engineers in general. Secondly, since the physical properties of test-bars in this class of steel are not solely measures of steel quality, but of steel quality plus heat-treatment practice, it becomes even more important that molten steel of high standards of quality and uniformity should be supplied to the foundry. Moreover, the fully-heat-treated alloy steels are more sensitive to incorrect steelmaking conditions and

* Paper presented to the National Trades Technical Societies Sheffield section. The Author is associated with Samuel Osborn & Company Limited.

FIG. 1.—*Tropenas converter plant during the blowing of a " heat "; on the left are the cupolas.*

practice than are the low- and medium-carbon steels.

Practically all steels now available in wrought form, including the high-alloy, heat- and corrosion-resisting types are regularly made also in the form of castings. In addition, a large tonnage of castings is produced in what is primarily a casting composition, that is, in austenitic manganese steel, the making of which presents special problems.

In this Paper, it is intended to outline the special conditions which have to be met by the foundry melting department so that it can provide an efficient service to the foundry. The word *service* is important: the melting shop acts as a service department to the foundry in just the same way as the sand mill. Not only must the liquid steel supplied to the foundry be correct in quantity, quality, composition and temperature, but it must be supplied at the right time, and furthermore an exacting timetable involving several furnaces is liable to be upset at any time by such accidents as the breakage of a large mould or core. At such times, and in fact at all times, there must be the fullest co-operation and the best of feeling between melting and foundry departmental staff. The demands of the foundry are often difficult to satisfy.

Production Problems

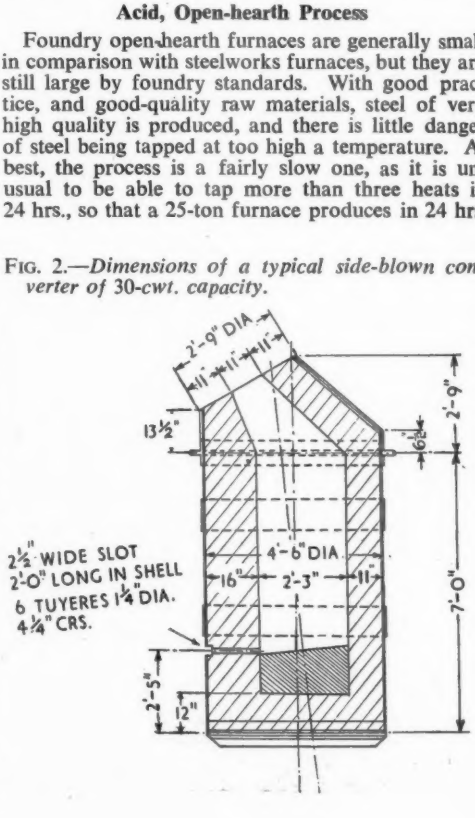
Most steel foundries are essentially jobbing shops, although many have mechanized moulding sections also to be catered for by the melting department. Unfortunately, the demands on the melting department of heavy, floor-moulding sections and light, repetition sections are entirely different. The size of the largest casting regularly made by a foundry is governed first by the space moulding boxes and crane capacity available, and, secondly, by the weight of steel which can be accumulated in one place at one time. For the odd, oversize casting it is possible to combine melts of steel from two or more furnaces, but this always causes a certain amount of inconvenience, which eventually means loss of shop output. On the other hand, the ideal steel plant for a mechanized foundry would be that which supplied steel continuously, so that the whole cycle of moulding, casting, and knocking-out would become a truly continuous operation, like that of a mechanized iron foundry, instead of the batch operation which in fact it is. This ideal was reached in some of the wartime tank-track-link foundries employing an arc-melting furnace tapping at intervals into a large holding furnace, from which steel was drawn frequently. There, however, austenitic manganese-steel was being handled, which is easier to deal with in this way than carbon or low-alloy steels. Furthermore, runs of castings are seldom sufficiently long except during times of war to permit continuous manufacture of one type of casting or even one grade of steel.

Apart from that exception, the nearest one can approach to the ideal at present is to supply batches of steel at frequent intervals and in sufficiently small quantities to ensure the temperature of metal remaining substantially constant during casting. It will be seen how difficult it is to satisfy both demands in the same works, and from the same melting plant. The jobbing floor may deal with castings needing many hours of moulding and closing time, and require large quantities of steel at infrequent intervals, but with a much-reduced demand for liquid steel between times. Unfortunately, too, furnaces large enough to deal with this peak load are too large to work intermittently, owing to the large mass of refractory material in their structure, and, in fact, they can only run efficiently on a 24-hr. basis. Steel foundries tend to work as far as possible on a day shift only, and in this respect differ from steel works producing ingots and rolled sections where 24-hr. operation is the rule. The first problem to be dealt with is, therefore, the selection of suitable steelmaking plant which can cope with such a mixed demand. Apart from the size and number of units, the advantages and disadvantages of the various processes must be considered. The processes available are generally as follow:—(1) Acid, open-hearth; (2) basic, or acid electric-arc; (3) converter, usually of the surface-blown type, with an acid lining, and (4) basic, or acid high-frequency furnace.

Acid, Open-hearth Process

Foundry open-hearth furnaces are generally small in comparison with steelworks furnaces, but they are still large by foundry standards. With good practice, and good-quality raw materials, steel of very high quality is produced, and there is little danger of steel being tapped at too high a temperature. At best, the process is a fairly slow one, as it is unusual to be able to tap more than three heats in 24 hrs., so that a 25-ton furnace produces in 24 hrs.

FIG. 2.—*Dimensions of a typical side-blown converter of* 30-*cwt. capacity.*



as much steel as does a 2-ton converter in a nine-hour day. Owing to the quantity of brickwork in the structure, the acid open-hearth furnace must be run on a continuous basis, together with its gas producers, and it is rather inflexible in the size of charge it can deal with satisfactorily. An occasional oversize heat can be made, but such must be prepared for some days ahead by washing out the bottom and building up the banks. Most grades of carbon and low-alloy steels can be made successfully, but the process is not really suitable for very-low-carbon steels of the high-permeability type, and is quite unsuitable for 14 per cent. manganese or stainless steels. Furthermore, large quantities of steel at intervals of eight hours or more are not what is wanted for a foundry producing castings of small weight. Even if the steel remained hot enough to cast all the moulds, the floor space and moulding-box parts required would be enormous. It will be seen, therefore, that the place for the acid, open-hearth furnace is in the foundry producing large castings and preferably where a basic production loading of ingot steel exists. One British steel foundry, specializing in very large castings, gets round the problem of steel supply very adroitly by having no melting plant at all, but importing liquid steel as required from the adjoining steel works.

Electric Furnaces

The electric-arc furnace probably comes nearest the steelfounder's ideal. Units of from ½-ton up to 25-ton capacity and over are available, but furnaces between one and five tons are usual in foundries. In this range of sizes, day-work only is quite practicable, a slightly higher power and electrode consumption and a somewhat shorter life of lining being the price paid for intermittent working. The rate of output of a furnace is governed to a great extent by the rating of the transformer, but for any given transformer size, the production rate of the acid-lined furnace is higher than that for the basic. The acid-lined furnace is generally used for the normal carbon and low-alloy range of steels, but can be used to make steels of fairly high alloy content, in which case the tendency is for the operation to be one of steel melting rather than steel making. Unfortunately, owing to the reaction between manganese and the silica hearth of the furnace, it is not possible to make 14 per cent. manganese steel in the acid, electric arc furnace. Since no removal of sulphur or phosphorus is possible, the process relies on the availability of suitable scrap, but it is possible—where two or more arc furnaces are installed—to work one with an acid lining and supply it with the scrap generated by the basic furnaces which is then of low sulphur and phosphorus content.

The basic-lined arc furnace is probably the most versatile steelmaking unit available. It is capable of making any steel and of utilizing any kind of scrap though naturally it gives the best results when supplied with good-quality raw materials. At best its rate of production is somewhat lower than the acid-lined arc furnace, since at least one complete change of slag is involved, unless the operation is one of "dead" melting only.

"Baby" Bessemer

The surface-blown converter has a special place in the lists of foundry steelmaking processes. Its supreme advantage—that of being able to supply heats of steel at intervals of 20 to 30 min.—sufficiently important to outweigh most of its quite serious disadvantages, especially where a mechanized section has to be served. At the same time, because of the short time required to produce a "heat" of steel, metal from a number of "blows" can be accumulated in one ladle so as to cast a job requiring up to four or five times the nominal capacity of the converter. With the addition of a separate melting furnace of the hearth or cupola type for melting ferro-manganese, austenitic manganese steels can be made by the simple mixing in the ladle of molten ferro-manganese with converter metal. Low-alloy steels can be made by means of ladle additions of cold ferro-alloys. The chief disadvantages of the process are the difficulties of control, and the fact that it is dependent on a supply of good-quality scrap and good-quality coke.

High-frequency Furnaces

The last process is easily summed up; the high-frequency steel melting process, whether acid or basic, is able to produce any composition of steel and the quality of the produce is entirely dependent on the quality of the charge. High-frequency plants are very flexible, and the use of two or more alternative furnace bodies for use with one set of electrical gear ensures maximum availability. The electrical rating of the plant is such that for amounts of furnaces up to one ton "heats" can be turned out in from 1 to 1½ hours.

Costs

It will be noticed that no mention has been made of relative costs of steel in the discussion of the possible processes. Cost is of course a most important factor, but it should be remembered in comparing steelmaking costs, that:

(1) Since the cost of liquid steel is about 15 to 20 per cent. of the total manufacturing cost of a steel casting, while the steelmaking cost is something like 40 to 50 per cent. of the total manufacturing cost of bulk steel bars, a small reduction of cost of liquid steel to the foundry is of relatively smaller importance.

(2) Local conditions governing costs of fuel, power, and raw materials vary greatly.

(3) Besides direct cost, factors of convenience and suitability, which are difficult to assess in terms of cost per ton must be considered.

As an example, the side-blown converter has a valuable place in the steel foundry in spite of relatively high operating costs, because of the saving obtained by quick turn-round of moulding boxes and floor space when using the converter process. However, for general guidance, the following relative costs of processes may be of interest. The standard in this case has been taken as 100 units for the cost of one ton of liquid steel in the ladle,

Steelmaking for the Steel Foundry

produced by the side-blown converter and Table I shows relative cost of liquid steel made by various processes, whilst Table II details the proportion of steel castings made in 1951 by each process.

TABLE I.—*Relative Costs of Foundry Steelmaking Processes.*

	2-ton Converter.	4-ton basic, arc.	H.-F. furnace.	4-ton acid, arc (estimated).	Acid, open-hearth (estimated).
Operating cost per ton	44.4	50.5	80.4	45	42
Raw-material cost per ton for 0.25 per cent C. steel ..	55.6	45.2	49.7	48	48
Total cost per ton ..	100.0	95.7	131.1	93	90

TABLE II.—*Production of Steel Castings by Different Processes in* 1951. *(In Thousands of Tons.)*

Open-hearth, Acid.	Open-hearth, basic.	Electric.	All other processes, (largely side-blown converter).	Total.
50.5	9.9	244.5	178.9	483.8

It will be seen that the converter and the electric furnace processes are by far the most important in quantity, so it is proposed to dismiss the open hearth furnace from active consideration.

Converter Process

Rapid operation is the strongest factor in favour of the use of the converter melting process, so the layout must be designed with this end in view. A melting plant consists basically of a cupola and a converter vessel. To give 100 per cent. availability, at least two cupola furnaces are necessary, so that they can be used on alternate days, with a day of patching and drying between days of operation. Similarly, as converter vessel "life" is measurable in terms of days, there must be provision for rapid changing of vessel bodies or alternatively, installation of two complete vessel mountings with their blowers, etc., so that at least one is available at any time. Raw materials are usually stored outside the foundry buildings, so means must be provided for the handling of weighed charges from the storage area into the cupolas, and likewise to remove slag, rubbish, etc., from the vicinity of the melting shop.

In connection with the converter plant layout the following factors must have consideration:—

(a) There must be a weighing machine where all charges can be weighed.
(b) The cupola skip hoist is best arranged so as to charge either of the two furnaces.
(c) A weighing machine for molten metal must be provided and on it the transfer ladle can stand while being filled.
(d) If the layout envisages continuous double-desulphurization, then two cranes should be available in the melting bay.
(e) There should be a large area provided for the preparation of ladles, for at least eight ladles are required to serve a converter plant.
(f) In the layout of the Author's foundry, all finished steel leaves the melting shop *via* a bogie on a transfer truck. In this way, it can be sent into bays on either side of the melting bay, and release the melting department cranes quickly.

(Fig. 1 shows the actual converter plant during the blowing of a heat.)

Plant Factors

With regard to the cupola and converter units themselves, there are some important facts to be considered. Cupolas should be of adequate capacity, bearing in mind that with high percentages of steel in the charge, output per square foot of the cupola cross-sectional area is lower than with normal pig-iron charges. A cupola gives best results when driven fairly hard, but not overdriven. A good basis for calculating the melting rate is 900 lb. per hour per sq. ft. of the cross-section at the melting zone. Tuyeres should be of total area 1/6 to 1/7 of hearth area, and about six in number. Blower capacity should be provided to deliver about 500 cub. ft. of air per min. per ton capacity, at pressure of up to 15 in. w.g. Linings may be of best-quality fire-brick or of rammed refractory, with

FIG. 3.—*Modern electric-arc furnace, of 3-tons capacity, for steel melting. It has a swing-aside roof to facilitate charging.*

metal blocks built into the shaft in the region of the charging opening, so as to withstand the abrasion of the charge.

The converter, termed a side-, surface-blown or Tropenas unit to distinguish it from the bottom-blown Bessemer, consists of a steel shell, arranged for tilting, lined with either silica brick or rammed refractory material of the ganister type. The dimensions of a typical vessel of 30 to 40 cwt. capacity is shown in Fig. 2. It is fitted with six 1¼ in. dia. tuyeres which are supplied with air at up to 5 lb. per sq. in. by a Rootes or other type of positive-displacement blower capable of supplying 3,000 cub. ft. air per min. (for a 30 to 40 cwt. vessel). Means are provided for adding oxygen to the air by tapping an oxygen line into the air main between blower and vessel.

Where rammed monolithic linings are preferred for the converter, the damp, graded refractory is rammed around suitable block patterns using air rammers, after which the tuyere formers and the blocks are withdrawn and the lining is allowed to air dry for as long as possible. It is then dried for a further period under gentle heat and finally placed in position in its mounting and raised to working temperature before use. The length of the air-drying period has a marked effect on the lining life, and should be of at least a week's duration. Such a lining will last for 80 "blows"—a normal 5-day week's work—after which the face is chipped down and the vessel re-rammed to shape.

Operation

For many years, cupolas for supplying converters used a charge consisting of hematite pig-iron together with such steel scrap in the form of risers as was produced in the foundry itself, amounting to 30 to 50 per cent. of the metallic charge. Since the cost of hematite pig is much greater than the cost of steel scrap purchased outside, the practice has developed of replacing part of the hematite iron in the charge with bought-in steel scrap.

The metallic charge for the cupolas nowadays consists of 80 to 100 per cent. steel scrap, the balance, if any, being made up with hematite iron. One advantage of charging some iron is in reducing to some extent the wear on the cupola lining, as high-steel-scrap charges are undoubtedly more severe on linings than the old-time pig charges. The addition of the correct amount of limestone to each charge is important in minimizing this wear. A typical charge for a 42-in. dia. cupola supplying metal to a (nominal) 2-ton vessel is as follows: Steel scrap: 11 cwt.; hematite iron: 1 cwt.; limestone: 40 lb.; coke: 2¼ cwt.; and ferro-silicon (45 per cent.): 28 lb. which represents a metal to coke ratio of 5½:1. This ratio is poor compared with the 8 or 9 to 1 ratio possible with all-pig charges. Under these conditions, cupola melting losses average 4 per cent., and metal of 3.1 per cent. C, 1.2 per cent. Si. is tapped at 1,350 deg. C. Modern developments in hot-blast cupolas of several kinds foreshadow the possibility of reducing the coke ratio, and at the same time increasing the production rate for any given size of furnace.

One result of using high percentages of steel in the cupola charge is a low silicon content of the resulting metal. While it is possible to "blow" steel satisfactorily despite quite a low initial silicon content, success is dependent on getting really "hot" cupola metal, and the resulting steel is unlikely to be as hot as the foundry often requires. Consequently, in order to be sure of getting "hot" steel it is usual to make up the silicon to 1.2 per cent. or so by the addition of lump ferro-silicon—to 1.2 per cent.—or of silicon briquettes to the cupola charge. In addition, to get "very hot" metal, more silicon may be added directly to the converter vessel, though, where the plant is equipped for oxygen enrichment of converter air, this extra silicon is seldom necessary.

A further disadvantage of the high-steel-charge technique is increased sulphur pick-up during melting. This, added to the (generally) poor-quality of coke now available, makes necessary a desulphurizing operation on the cupola metal. For this, cupola metal with a sulphur content of 0.10 to 0.12 per cent. is tapped into a transfer ladle, preferably basic lined, where the desulphurizing operation is carried out by the addition of dense sodium carbonate at the rate of 30 lb. per ton of metal. If space and cranes are available, a double desulphurizing treatment is worthwhile, as a final sulphur content of 0.02 per cent can then be obtained, while with the single treatment the final sulphur is around 0.045 per cent. In either case, before transferring the metal to the converter, all the slag must be raked off.

Blowing Process

Surface-blown converters are quite critical as to the weight of metal charged, since the level of metal in the bath must be in correct relation to the tuyeres when the vessel is standing at the proper angle for blowing. As the lining wears, the weight of metal required to maintain the bath level increases, so that a vessel which holds 30 cwt. of metal when newly lined will require a charge of 40 cwts. or more by the time it is taken out of service. For this reason, as previously stated, a weighing operation is always necessary at this part of the operation. The slag-free metal, which should be at a temperature of at least 1,350 deg. C. is poured into the converter, which is then raised into blowing position with the metal level reaching just below the tuyeres, which point down on the surface of the bath at an angle of 5 to 8 deg. The blast is turned on and the reaction familiar to all founders, which results in the oxidation of silicon, manganese and carbon, takes place, so that in approximately 15 min. the metal in the converter has reached a composition of about 0.05 per cent. carbon, with silicon and manganese very low. The end of the operation, marked by the "drop" of the flame must be observed very closely so as to avoid over-oxidation of the bath, and the blast is turned off promptly at that point. The bath will have a temperature of 1,650 to 1,700 deg. C., depending on the initial temperature and composition of the cupola metal, and will have lost up to 10 per cent. in weight through oxidation of silicon, manganese, carbon and iron, and by ejection of splashes. After turning

FIG. 4.—*Lip-pouring of small moulds from double-hand shank ladles.*

down the vessel into the horizontal position, hot, lump ferro-manganese is added to the bath, partly to commence deoxidation, and partly to bring the manganese content of the steel up to the desired value. Lump ferro-silicon is next added, followed by heated pig or re-carburizing iron where a small increase in carbon content is required. Where a grade having over 0.30 per cent. carbon is being made, the re-carburization is done by means of desulphurized cupola metal added to the vessel or to the ladle before tapping on the steel. The slag is held back while the steel is tapped into the ladle. Final deoxidation is accomplished by adding 2 to 3 lb. per ton of stick aluminium to the ladle, and in addition to this, for very-low-carbon steels, an additional powerful deoxidant such as calcium silicide is also used to help to avoid the formation of pinholes in castings.

In addition to the manufacture of straight carbon steels by the converter process, many alloy steels can easily be made. For austenitic manganese steels, ferro-manganese, previously melted in a separate furnace is mixed in the ladle with "blown" metal. As nickel and molybdenum are not affected by any part of the process, they can be added to the cupola in the form of alloy steel scrap or as virgin metal or ferro-alloy to the cupola metal, or to the finished steel. Chromium is conveniently added in the form of exothermic briquettes to the ladle receiving the steel.

Probably the most important advance which has been made in the converter process for many years is the addition of extra oxygen into the air blast, so as to enrich the oxygen content of the air in degree from approximately 20 up to about 30 per cent. The result of this is to shorten the time of the "blow" from about 15 to about 8 or 9 min., and to increase the temperature increment for any given metal composition. This shortened cycle makes the accumulation of a number of heats in one ladle for pouring a heavy casting much easier, and makes it possible to blow good "hot" heats from cupola metal which for some reason is colder than desirable.

Electric-arc Furnace

Perhaps the most popular size of foundry arc-melting furnace is that of the 3-tons capacity, which with a transformer of about 1,200 kva capacity, is capable of producing a melt of steel in 2½ to 3½ hours. Such a rating of 400 kva per ton has been regarded as standard for some years, but American steel founders have led the way in showing that arc furnaces can use efficiently much higher power inputs than this, up to at least 1,000 kva per ton. In this country, 600 to 800 kva per ton is considered a high rating, and there are still too few furnaces of 3-tons capacity, which, with transformers of 1,800 to 2,000 kva, are able to turn out a heat in 1½ to 2 hours. To maintain this rate of output, the furnace must of course be top charged, and the layout of the whole plant must be arranged so as to keep the furnace actually melting for as much of the total working period as possible. Adoption of a top-charged furnace implies the use of a charging bucket or basket, which is conveniently filled by a lifting magnet from an overhead crane and it is usual to have the scrap storage area inside the foundry building so that one crane suffices for unloading supplies of scrap, filling charging baskets, charging the furnace, looking after furnace maintenance—such as roof and door changing, removal of slag and rubbish—and in many cases handling the finished steel as well. It is far easier to instal an arc furnace in a corner of the foundry than it is to instal a converter plant, but for maximum efficiency careful layout is just as important.

Two factors should be noted in the layout of an electric-arc-furnace melting department: (1) Slag-making materials—lime or limestone, fluorspar, etc. —and ferro alloys must be kept dry, so for these substances, at any rate, indoor storage is essential, and (2) it is convenient, if nothing more, to store refractories in the vicinity of furnaces and dry, warm storage improves the performance of most refractory materials.

Typical Details

Fig. 3 shows a modern, swing-roof electric-arc furnace during charging. Except for quite small units, only one of the many types of electric-arc furnace originally designed has survived for steel making to the present day, and that is the 3-phase 3-electrode furnace. A typical 3-ton unit has a steel shell about 7 ft. dia., which is trunnion mounted for tilting and has a swing roof for top charging. Graphite electrodes 6 to 9 in. dia. are used, controlled by one of the modern rotary-controllers, working on a modification of the Ward-Leonard principle. The transformer has from three to six tappings covering a voltage range of 80 to 200.

In the case of the acid-lined furnace, the hearth is made of silica material of the ganister type,

rammed into position, with a rammed or burned-in silica-sand working surface. The side walls are of silica brick, and the roof is normally of the same material. Sometimes, roofs of high-duty firebrick or sillimanite are used. The basic furnace has a hearth of basic materials, usually of burned dolomite, but sometimes of burned magnesite; it is rammed into position. The hearth material may be bonded with tar for ramming, or maybe ground finely and rammed dry. The sidewalls are of basic brick, dolomite brick, magnesite or chrome-magnesite, or may be, of magnesite packed into steel tubes, or even of dolomite rammed *in situ* around a former.

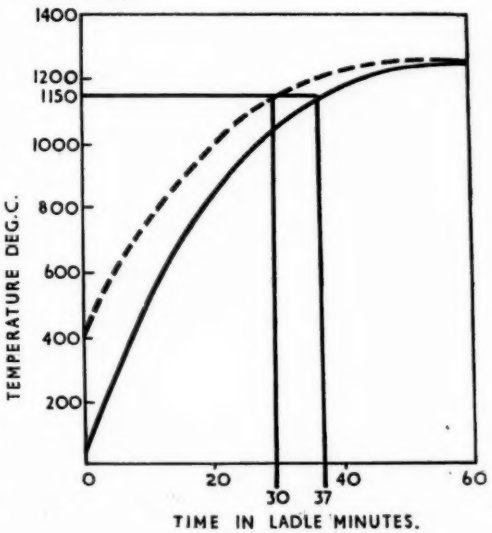
Operation

The charge for the acid furnace consists of selected steel scrap of low sulphur and phosphorus content. Turnings are usually avoided, as cutting oils invariably present are apt to have a high sulphur content. Melting is completed as quickly as possible, with the aim of producing a fully-melted, slightly-oxidized " hot " bath, having about 0.20 per cent. carbon more than the finished steel is required to contain. A quick, vigorous " boil " is promoted either by the addition of iron ore or the use of oxygen, and after a quick carbon estimation has shown the content to be correct, the bath is deoxidized with ferro-silicon, and the carbon and manganese content adjusted. The furnace is then tapped and final deoxidants such as aluminium and calcium-silico-manganese added to the ladle. The most important feature of the process is the quick, active " boil " to reduce the hydrogen content of the bath, and the short refining time, so that the metal bath does not pick up gases to an undesirable extent.

The basic process is much more accommodating in the type of scrap required, as it can turn virtually any kind of ferrous scrap into good steel. It must be remembered, however, that for maximum production rates the metallurgical load must be kept as small as possible. Steel turnings, provided they are not too bulky, are ideal for up to 50 per cent. of the charge, and their high sulphur content is easily dealt with in the normal course of a heat. The remainder of the charge is made up of foundry returns and bought-in scrap and is arranged to contain, if necessary with the addition of anthracite, about 0.15 to 0.20 per cent. carbon more than is required in the finished steel. Lime or limestone is added to the charge to the extent of about 4 per cent. CaO, and the aim is to melt the charge so that a relatively cold molten bath is formed, covered with a slag rich in lime and with a sufficiently high oxygen content to ensure the transfer of phosphorus from the charge to the slag. The source of this oxygen may be rust on the scrap, or may be from an addition of ore to the charge. As the temperature rises, the bath begins to " boil " and the injection of oxygen, or the feeding of ore at this time ensures that the boil is really vigorous. By " vigorous " is meant a boil which will remove 0.15 per cent. carbon in 20 to 25 min. By the use of oxygen injection, of course, much higher rates of carbon removal are achieved.

It is only during the boiling period that hydrogen and nitrogen are removed from the bath by being swept out by the large volumes of carbon monoxide evolved, so a secondary object of the boil is to reduce the concentration of these gases to a minimum. The vigorous boil is even more important in the basic than in the acid process, as the basic refining operation involves the use of an entirely new slag much of the moisture content of which passes into the steel in the form of dissolved hydrogen. When the boil has proceeded far enough to reduce the carbon content to the correct value, and check analysis has shown the other elements to be correct, the slag is entirely removed from the bath. A new slag of lime (in the form of burned lime or preferably of limestone) and fluorspar is thrown into the furnace, fused, and additions are made of ground anthracite sufficient to make the slag white and falling, that is, with a calcium carbide content of about 1 per cent. Under this slag, sulphur is removed and the metal bath is deoxidized, partly by the action of the slag, and partly by the addition of lump ferro-silicon and ferro-manganese to it. After chemical analysis of bath samples, bath composition and temperature are adjusted and the furnace is tapped. The usual final deoxidants are added to the ladle. During the refining period, the hydrogen and nitrogen content of the steel increase, so it is important that the time the steel is held under the reducing slag is the shortest possible compatible with thorough deoxidation. Nitrogen has little effect on the properties of steel castings, but hydrogen is known to be a primary cause of the formation of pinholes and so must be kept to a minimum, especially where the steel is to be poured into green-sand moulds. The source of the hydrogen pick-up

FIG. 5.—*Temperatures attained by a stopper rod—using 4½-in. dia. fireclay sleeves—when teeming steel castings.*



in the refining period is moisture introduced into the furnace along with slag-making materials and ferro-alloys, which emphasizes the necessity for dry storage of these items. Limestone is not subject to hydration, though burned lime is, and so the former is preferable for use to make the reducing slag.

Alloy-steel Preparation

Low-alloy steels are easily dealt with in this process. Nickel is unaffected by the oxidation period, so this element can be added in the form of alloy scrap, and the composition of the bath corrected at any time in the cycle by the addition of nickel shot. Molybdenum is likewise not removed at any time, and can be dealt with in the same way, any additional molybdenum being added as ferro-molybdenum, or as molybdic oxide during the oxidation period. Chromium is oxidized to some extent, so a final correction for this element must be made in the reducing period.

High-alloy steels of the chromium and chromium/nickel types are made, broadly speaking, in the same way, but the great bulk of ferro-alloy additions to be made after slagging-off makes the reducing period a long and trying one, as most of these steels must be kept down to a very low carbon content. Preheating the ferro-alloys to 900 deg. C. helps to shorten this part of the heat. Austenitic manganese steel is made either by "boiling down" a low-carbon steel bath, slagging and adding ferro-manganese, or by "dead" melting a charge composed of nearly 100 per cent. manganese-steel scrap, and correcting for manganese loss by the addition of low-carbon ferro-manganese. Melting losses in electric-arc furnaces vary between 3 and 8 per cent. depending on type of scrap charged.

With regard to the high-frequency process, it will be sufficient to say that the operation is one of melting and deoxidation only. Successful working depends largely on the use of good-quality raw materials, and efficient segregation of scrap.

Temperature Control

The control of the temperature of liquid steel is a most important factor upon which the quality of the finished casting largely depends. Any steel casting should, ideally, be poured at the lowest temperature at which the metal will fill the mould cavity completely. With this ideal in mind, it will be seen that the foundryman is really interested in the "fluidity" of the steel, but, because of the difficulty of evaluating and measuring this property, fluidity is loosely translated into terms of temperature. The object of temperature control is therefore the tapping of furnaces at the lowest temperature at which all the moulds to be poured from the ladle can be filled satisfactorily, without the formation of a ladle "skull." Thickness of section of castings to be poured and the time required to dispose of a ladle of steel are variable factors, but by experience and observation of a particular composition of steel, they can be combined together and expressed as a temperature at which it is desirable that teeming from the ladle shall begin.

When the steel is in the ladle it is too late to think of controlling the temperature, so the average drop in temperature from furnace to ladle is found by taking a number of tests. By adding this average decrease to the required ladle temperature, the steelmaker obtains a value at which to tap a furnace with every hope of making a successful cast. The immersion-type of pyrometer using a rare-metal thermocouple enables him to make a quick and accurate measurement of bath temperature as a matter of routine, and thus removes one variable from his task. Unfortunately, the technique is not very suitable for use with the converter, where a "blow," having once begun, must proceed to its conclusion, but it is still possible to take temperature measurements on converter steel in the ladle and direct the steel into moulds most suitable to receive it.

Pouring

There are three types of pouring method practised in steel foundries, namely:—(*a*) Pouring from hand shanks; (*b*) pouring from lip ladles; and (*c*) bottom pouring from stopper ladles. Hand shanks are preferred for very small castings, where a stopper ladle would be required to be opened too frequently. Shanking is very effective and produces little waste, but occupies the time of a large number of men, and tends to bring all other operations in the shop to a standstill while it is going on. Three shanks of 80-lb. capacity each can be used to handle a 2-ton heat of steel, and require two men per shank as well as a ladleman—and a skimmer at the casting point. The shanks, lined with rammed refractory material and preheated to full red heat, are filled in turn from a stopper ladle held by the crane or on a stand. After filling, a light cover of steel or asbestos is put on top and the shank is carried by two men to the casting point, where the skimmer re-

FIG. 6.—*Casting of small moulds in Osborn's mechanized foundry from a bottom-pouring ladle.*

moves the cover and skims off any slag while the carriers pour the moulds. When empty, the shank is returned for refilling as often as required until the ladle is empty. In this manner, 30 to 40 cwt. of steel can be poured in 15 min. The pouring of small moulds from hand shanks is shown in Fig. 4.

Lip-pouring ladles have several advantages for the running of medium-weight and large castings, such as the saving in the cost of stopper refractories —amounting to something like five shillings per ton of steel for a 2-ton ladle—and the freedom from loss of metal which occasionally occurs with a stopper ladle. Moulds can be filled quickly with little erosion of the runner system, but there is a danger of slag being carried into the mould even with careful skimming, and this danger is greater with basic than with acid slags.

For austenitic-manganese-steel castings of over about 2 in. section, lip pouring is essential, as an excessively high casting temperature has a very bad influence on this material, and manganese-steel which is hot enough to run through a nozzle at all is too hot for castings of any weight. Lip ladles should have a very large shaped spout incorporated in the shell plating, and be tilted by means of a hand wheel through worm gearing of such ratio as to be irreversible. The centres of the trunnions should be positioned so that the ladle is in balance when just over half full. Firebrick tiles or rammed refractory material form the lining, and ladles are dried out and heated to "red heat" before use.

The bottom-pouring ladle finds a place in the mechanized foundry for the production of small- and medium-size castings, and for floor moulds of medium and large size. As steel is drawn from the bottom of the ladle, slag cannot enter the mould, and because the slag covering remains on the metal, the rate of cooling is lower than when the lip-pouring ladle is used.

Ladle Preparation

Ladles are lined with firebrick, etc., and fitted with nozzles of ¾ to 2 in. bore, usually of fireclay. For casting manganese-steels, mangesite nozzles are used, since manganese-steel attacks firebrick nozzles rapidly. Stoppers are made up of wrought-iron rods covered with firebrick sleeves with ends of firebrick or plumbago brick pinned or screwed on to the iron rod which seat in and close the nozzle hole. Before use, ladles are thoroughly dried out, as any moisture present is likely to increase the hydrogen content of the steel. In addition, they are heated so as to reduce to a minimum the temperature drop of the steel during holding. A full, "red heat" of 700 to 800 deg. C. is preferred for small ladles, though as the size increases the amount of preheating becomes less important.

Temperature Rise of Stopper Rod

Some founders preheat ladles and then set in position the dried stopper just before casting. Others set the stopper and preheat the whole assembly, but while this appears to be the logical thing to do it has one drawback. The time during which a stopper-type ladle full of steel can be held with safety is limited—among other things by the heating of the stopper rod to such a temperature that it loses rigidity, and allows the joints in the stopper sleeves to open. It will be seen from Fig. 5 that preheating the stopper so that the rod is at a temperature of 400 deg. C. before tapping results in the stopper rod reaching its dangerous temperature 1,150 deg. C. in 32 min. as against 37 min. for a rod not preheated. Anything that can be done to speed-up the disposal of a ladle of steel not only permits colder metal to be tapped from the furnaces, but increases the safety margin of the stopper rod.

One way of doing this is illustrated in Fig. 6, which shows the casting of small moulds in a mechanized foundry. In this case, the ladle is held in a stationary position while small moulds are pushed beneath it on roller conveyor. Two hundred moulds in straight carbon or manganese-steel are regularly poured from a 2-ton stoppered ladle on this set-up in approximately 30 min.; a considerably shorter time than if the ladle were moved for each mould. For general floor casting of medium-weight moulds, the ladle is moved from mould to mould, and here the foundrymen can help by grouping the moulds together and arranging them with their runners in line in the direction of the longitudinal travel of the crane. The nozzle size selected should be the largest which will allow full opening of the stopper without over-flooding the runner system of the moulds. Nozzles are available from ¾ to 2½ in. or more, the usual foundry range being 1 to 2 in. bore.

At the stage when the steel is in the moulds, the responsibility of the steelmaker ends, but his interest should not end here. The manufacture of liquid steel is not an end in itself, but an operation in the production of steel castings on whose quality and economic production the well-being of the foundry depends. All concerned should, therefore, take a wide interest in all stages of production, and their active co-operation is certain to have good results.

In conclusion, the Author thanks the directors of the Osborn Foundry & Engineering Company Limited for permission to publish this Paper.

Foundry Coke Prices

The British Coking Industry Association announce that the Minister of Fuel and Power has authorized the following increases in foundry coke prices:—

District.	Increase (per ton).
Scotland	17s. 6d.
Durham	17s. 6d.
Lancashire	17s. 6d.
Wales: *Group* 1—Coedely, Tondu, Maritime (Crown)	19s. 6d.
Group 2—Maritime (G.W. Standard), Bedwas	15s. 3d.
Group 3—Bargoed	12s. 6d.

It is understood that the Ministry will allow these increases to be operated as from May 3 where those concerned had been warned that an increase was likely from that date. A strong and entirely justified protest has been lodged to the British Coking Industry Association against the retrospective application of these price increases.

G

The Modern University and Local Industry

Large Measure of Co-operation Recorded

In a valedictory address to the members of the Newcastle-upon-Tyne and district branch of the Institute of British Foundrymen, Professor A. Preece, who has worked in British universities during the last twenty years, emphasized the contribution which they are making through their interest in applied research, and presented some interesting facts which have an important significance to industry generally, reference to which is quoted here:

Modern society has now become so dependent upon scientific invention that only by the rapid application of scientific discovery to manufacturing methods and techniques can a nation hope to maintain a satisfactory position in world trade. This is particularly true of Britain, with her large population and decreasing natural resources.

In recent years, developments in engineering and chemical industries have been so rapid that they have created a need for materials with special properties, indeed, in many instances, the further development of existing processes or machines is held up by the absence of suitable materials of construction. The successful introduction of the gas turbine is perhaps the most striking example of technical development having to await the production of suitable alloys. These new and complex materials call for extensive research and it is in work of this kind that universities, by more effective collaboration with local industry, can play an ever-increasing part in Britain's economic recovery.

Facilities for Fundamental Research

The universities, with their diversity of interests and special equipment, are ideal places for the prosecution of fundamental research, and although Professor Preece was concerned mainly with applied research, which more directly affects industry, he emphasized the debt owed to the comparatively small number of scientists who spend their lives and in some cases their private fortunes, in scientific enquiry for its own sake, without any thought of the possible practical application of their work. If it were not for these men, with their explorations into new territories of scientific endeavour, the possibility of creating new industries would inevitably disappear or at least become insignificant. He cited some examples of important industries which were made possible by the work of scientists who, when they were actually carrying out their experiments, had no conception of these developments, and were probably not interested anyway. The great electrical industry had its beginning in Faraday's discovery of electro-magnetic induction. The fundamental work of Clarke, Maxwell and Hertz which enabled Fleming to produce the thermionic valve, led in its turn to the development of radio. The ever-increasing plastics industry had emerged from simple experiments in polymerization of complex molecules.

The practical benefits of this type of work are not immediate indeed they are accidental and often long postponed. The position is different with applied research which is more directly concerned with the immediate needs of industry, and if universities are to play their part they must keep themselves informed of the problems and difficulties which confront the development of these new materials. Much is already being accomplished by collaboration with research associations, with the Department of Scientific and Industrial Research and the Ministry of Supply. Professor Preece's own department at King's College is collaborating with these organizations at the moment, but he believes that more could be done by direct contact with local works.

There are some organizations which are too small to justify a research department or even a laboratory, even if they do possess one it often happens that some problem crops up which requires a certain type of apparatus or a certain skill which is not available domestically, but which would be found in a university, and, provided the work was not too *ad hoc*, a modern university would welcome the opportunity of collaborating with local industry in solving such a problem. Professor Preece emphasized this point because occasionally universities were criticized for their aloofness from the normal workaday life of industry. Whatever may have been the case in the past, universities to-day are, he said, most anxious to participate in all matters which concern the well-being of the nation, indeed they regard such a policy as one of their reponsibilities. It is by no means unusual when attempting to solve a works problem to come across new and unsuspected phenomena which in their turn open up fresh fields of investigation. In this way a two-way traffic in ideas grows up between the university and industry to the benefit of both.

Examples

Perhaps the work of Louis Pasteur provides the greatest example of far-reaching scientific discovery arising from investigations into industrial problems —when he was appointed Dean of the Faculty of Sciences at Lille in 1854 his attention was drawn to various problems in the local industry which, at that time, was concerned with the manufacture of alcohol from beetroot and grain. As a result, he devoted himself to the subject of fermentation; this opened up a vast study into the origin and functioning of living organisms which gradually expanded into the science of bacteriology and so on to bacterial diseases such an anthrax, cholera, rabies, and the like. Rarely has any man been so privileged to serve humanity as did Pasteur. The successful application of sulphonamide drugs today had its starting point in Pasteur's early interest in the manufacture of alcohol and vinegar.

(*Continued on p.* 566)

Institute Elects New Members

At the Council meeting in London on April 10, the following were admitted to membership of the Institute of British Foundrymen in the grades indicated:—

As Subscribing-firm Members

The Hamworthy Engineering Company, Limited, Hamworthy, Poole, Dorset (representative: L. Sharp).

As Members

A. H. Addison (Alvis, Limited, Coventry); P. J. Allender, PH.D., B.A. (British Small Arms Company, Limited, Birmingham); T. E. Barlow (International Minerals & Chemical Corporation, Illinois, U.S.A.); Wm. Brown (W. Brown, Hitchin, Herts); J. Codegone (H. J. Maybrey & Company, Limited, London); J. R. Greenwood, Jnr. (Craven Bros. (Manchester), Limited, Stockport); A. Henson (Hillsyde Foundry, Stoke-on-Trent); Z. Z. J. Kosarski (Sheepbridge Steel Castings, Limited, Sutton-in-Ashfield, Nottingham); J. M. Langham, M.A., A.M.I.MECH.E. (J. Stone & Company (Charlton), Limited, London); K. Marston (Armstrong Siddeley Company, Limited, Coventry); J. H. May (J. T. May, London); J. P. Mitchell (W. M. A. Robertson & Company, Limited, Bedford); R. Palmer (Staveley Iron & Chemical Company, Limited, Nr. Chesterfield); D. M. E. Randell (Richard Thomas & Baldwins, Limited, Landore, Swansea); E. H. Ridgwell (Tubal Cain Foundry & Engineering Company, Limited, Cardiff); R. Scott, A.M.I.P.E. (H. C. Hopper (Kingston), Limited, Kingston, Surrey); R. M. Seligman, B.A. (A. P. V. Paramount, Limited, Crawley, Sussex); L. Smith (Lynn Smith & Company, also Roding River Foundry, Limited, Ilford); J. B. Stanley (Alliance Foundry Company, Colchester); F. J. Turner, A.I.M. (City Casting & Metal Company, Limited, Birmingham); R. D. Weatherell (Wright & Platt, Limited, Birmingham); T. H. Whitehouse (Foundry Equipment, Limited, and High Grade Castings, Limited, Leighton Buzzard); J. R. Booth* (Booth & Brookes, Limited, Burnham-on-Crouch, Essex); P. C. Booth* (Booth & Brookes, Limited); J. V. Chatterton, A.I.M.* (Cincinnati Milling Machines, Limited, Birmingham); J. Good* (Curran Steels, Limited, Cardiff); J. Gorman* (Caledonian Foundry, Limited, Greenock); J. M. Goymour* (Kampong Bahru Foundry, United Engineers, Limited, Singapore); D. W. Morris* (Vickers Armstrongs, Limited, Crayford, Kent); B. N. S. Perry, B.SC., A.M.I.MECH.E.* (G. Perry & Sons, Limited, Leicester); E. Raybould* (H. M. Hobson, Limited, Wolverhampton); T. Wolverson* (Stockton Casting Company, Limited, Stockton-on-Tees).

As Associate Members

F. W. Astell (Enfield Rolling Mills (Aluminium), Limited, Bradford); H. B'ackburn (Henry Wallwork & Company, Limited, Manchester); J. Catron (Davy & United Roll Foundry, Limited, Haverton Hill, Middlesbrough); C. A. Chandler (Davis Gas Stove Company, Limited, Luton); R. M. Chapman, B.MET. (K & L Steelfounders & Engineers, Limited, Letchworth); J. Clarke (K & L Steelfounders & Engineers, Limited); E. Davies (Guest Keen & Baldwins, Limited, Dowlais); R. C. Dean (Bridgend Foundry Company, Limited, Bridgend, Glam); C. Dennis (Frazer & Chalmers, Limited, Erith, Kent); I. H. Douglas, B.MET., L.I.M. (Birlec, Limited, Birmingham); G. Durand (G. & J. Weir, Limited, Glasgow); W. E. Fincham (J. Hobkirk, Sons & Company, Limited, Bedford); C. E. Fountain (H. J. Maybrey & Company, Limited); J. S. Greenwood (Morton's Ironfounders, Manchester); L. Harrison, PH.D., B.MET. (Sheepbridge Engineering, Limited, Chesterfield); R. J. Heed (Ley's Malleable Castings Company, Limited, Derby); S. R. Henrywood (Hamworthy Engineering Company, Limited); R. H. Hoyland, A.I.MECH.E. (S. Russell & Sons, Limited, Leicester); H. Ingleson (Sterling Foundry Specialists, Limited, Bedford); C. H. Jones (J. Hobkirk, Sons & Company, Limited); A. Kaye (E. & W. H. Haley, Limited, Bradford); A. Kilner (Beauford Castings, Limited, Elland, Yorks); J. Martin (Bristol Channel Foundries, Limited, Cardiff); P. S. McIntosh, B.SC. (MET.) (K & L Steelfounders & Engineers, Limited); E. S. W. Metcalf (62a, Parliament Street, Birmingham, 6); K. Mitchell (English Electric Company, Rugby); R. Muir (R.E.M. Patterns, Birmingham, 6); D. H. Needham (Douglas Kingsley Products, Limited, Leicester); J. S. Newcombe (Douglas Kingsley Products, Limited); W. E. Northwood (J. Hobkirk, Sons & Company, Limited); Wm. Pridham (Jones Sewing Machine Company, Manchester); A. Prince, B.MET., A.I.M. (The University, Southampton); L. Pritchett (J. Hobkirk, Sons & Company, Limited); D. T. Prosser (Guest Keen & Baldwins, Limited); V. V. Rahalkar (National Foundry College, Wolverhampton); J. Randall (Stanton Ironworks Company, Limited, Nr. Nottingham); T. Rogers (Enfield Rolling Mills (Aluminium), Limited); K. P. Shah (Shree Ram Mills, Limited, Bombay, India); C. H. Stanger (R. H. Harry Stanger, London); T. Swain (Heaton & Flint, Parkwood, Keighley); L. Tattersfield (Corn Products Company, Limited, London); S. G. Tinsell (Idoson Motor Cylinder Company, Limited, Tividale); L. Tompkins (J. Hobkirk, Sons & Company, Limited); M. Whittamore (J. Hobkirk, Sons & Company, Limited); T. Williams (Richard Thomas & Baldwins, Limited, Landore, Swansea); R. F. Davies* (Wednesbury Tube Company, Limited, Bilston); M. A. Flynn* (Dunlop Rim & Wheel Company, Foleshill, Coventry); W. W. Glick, L.I.M.* (English Metal Oxide, Limited, London); W. D. Hamilton* (Federated Foundries, Limited, Glasgow); R. W. G. Layton* (Atlas Malleable & General Ironfounders, Walsall); A. D. Lewis† (Henry Wallwork & Company, Limited, Manchester); R. Marshall* (John Brown & Company (Clydebank), Limited); R. L. Rice* (Pinhoe Engineering & Foundry Company, Limited, Pinhoe, Exeter); F. Sanders* (Grantham Ironworks, Limited, Bolton); G. D. T. Seveviratne* (W. G. Bagnall, Limited, Stafford); K. Steiner* (Foundry Services, Limited, Birmingham).

As Associates (*over* 21)

F. E. Cornwell (S. Walker & Sons (Mansfield), Limited); P. E. Cornwell (S. Walker & Sons (Mansfield), Limited); F. Cowperthwaite (Distington Engineering Company, Limited, Workington, Cumberland); J. Elliott (Metropolitan-Vickers Electrical Company, Limited, Manchester); R. Elliott (Stothert & Pitt, Limited, Bath); J. H. Evans (Llanelly Foundry & Engineering Company, Limited); K. W. Gennis (Morris Motors, Limited, Wellingborough); Wm. Havenhand (Sheepbridge Engineering, Limited); N. Holligon (Imperial Chemical Industries, Limited (Billingham Division), Billingham-on-Tees); R. Holmes (Hepworth & Grandage, Limited, Bradford); B. Larcombe (Brown-Firth Research Laboratories, Sheffield); T. W. Merrington (W. Shaw & Company, Middlesbrough); I. L. Morgan (Richard Thomas & Baldwins, Limited, Landore,

* Transferred.

† Transfer accepted to date from May 29.

Institute Elects New Members

Swansea); R. S. Smith (Distington Engineering Company, Limited); W. C. Stirk (Consett Iron Company, Limited, Co. Durham); I. J. Thomas (Glanmor Foundry Company, Limited, Llanelly).

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P. Appleby (Fairbairn Lawson Combe Barbour, Limited, Leeds); F. Askew (Consett Iron Company, Limited); D. W. Clarke (Phosphor Bronze Company, Limited, Birmingham); K. C. Harris (Brockmoor Foundry, Brierley Hill, Staffs); B. Hurst (Appleby & Company, Limited, Renishaw, Nr. Sheffield); J. W. Kaye (Henry Brook Company, Limited, Huddersfield); R. A. Lee (Appleby & Company, Limited); J. Lees (Petrie & McNaught, Limited, Rochdale, Lancs); R. A. Lindley (Appleby & Company, Limited); P. L. Marston (Low Moor Alloy Steelworks, Limited, Bradford); C. J. Murray (Armstrong Whitworth Metal Industry, Limited, Gateshead); J. Robinson (Leyland Motors, Limited); J. Rowland (Appleby & Company, Limited); T. B. Scott (Armstrong Whitworth Metal Industry, Limited); D. R. Tomlin (Appleby & Company, Limited); T. A. Towers (John Fowler & Company (Leeds), Limited, Doncaster); D. Wildey (Stanton Ironworks Company, Limited, Nr. Nottingham); K. Wright (Manlove Alliott & Company, Limited, Nottingham); R. G. Wrightson (Morris Motors, Limited, Wellingborough).

Fatal Accident at Lloyds' Foundry

The jury brought in a verdict of "Accidental Death" at the inquest held by Burton Borough Coroner, Mr. J. L. Auden, on April 21, on Mr. H. Harrison, of Burton, who was killed while working in the Wellington Street Foundry of Lloyds' (Burton), Limited, on April 9.

Mr. Charles Butler, a furnaceman employed by Lloyds', said that at 7.45 a.m. on April 9 he and Harrison put some chains round a casting 8 ft. by 4 ft. and weighing 35 cwt. The casting was moved by an overhead crane. When they went to remove the chains, Harrison could not get his off the casting. It was held by a riser—a piece of metal about three inches long projecting from the casting. Butler said that with one end lowered and the end with the jammed chain raised about three feet, Harrison struck the riser with a metal bar. The second time he struck it the riser broke off and the chain came away. The casting slipped to the ground causing the metal bar to fly out of Harrison's hands and strike him under the chin.

Replying to Mr. R. L. Lind, H.M. Inspector of Factories, Butler said the procedure was not unusual and had been used many times before. Leonard Frederick Barnes was driving the overhead crane that lifted the casting.

He told the coroner that the work was quite normal and. but for the accident, it would not have stood out in his memory.

Barnes said he saw Harrison use a metal bar to strike at something underneath the casting. The chain holding up the one end of the casting slipped. The casting fell and Barnes said he saw the bar fly up and strike Harrison under the chin.

Barnes said he shouted for help when he saw Harrison lying very still. Dr. E. P. M. Ball, assistant pathologist at Burton Infirmary, said death was caused by a broken neck.

Opinions Expressed at B.I.F.

Following the official opening of the Castle Bromwich section of the British Industries Fair, the Agent for Western Australia, the Hon. J. A. DIMMITT said his Government had somewhere between £8,000,000 and £10,000,000 worth of work in process of manufacture in the Midland area, and the various State Governments had between them approximately £75,000,000 of work being done in the United Kingdom. In Australia, as in a great many other countries, their aim was to be self-sufficient, he said, but when business had to be placed elsewhere, there was a natural preference for the Mother Country. "We have an intense loyalty towards the homeland," he added.

Optimism for 1955

"We are in for a grand year in 1954-55" said Mr. Arthur Keats, chairman of Fisher and Ludlow Limited at a luncheon of the B.I.F. Management Committee at Castle Bromwich on May 4. A year ago, he said, they had been worried about the possibility of an American recession, and had been "thinking this country into a depression." He believed that the worst of the recession had now passed, and that Britain had every reason to be optimistic in the future.

Mr. Keats gave a warning that we must watch our quality and prices. Manufacturers must export even if they sometimes found it less profitable and more trouble than home trading. Mr. Keats was speaking as national vice-president and Midland Regional chairman of the Engineering Industries' Association.

Trade with Belgium

At a luncheon at the B.I.F., Birmingham, on May 5, the Belgian Ambassador, the Marquis du Parc Locmaria, said that, in the economic sphere, trade between the United Kingdom and Belgium had always been one of the main elements. At one time the balance was to a great extent in favour of Belgium, but in 1951 Belgium exported to Britain goods worth £91,000,000 and imported goods to the value of £63,000,000. Last year, the two countries were almost equal and this year the balance was going still further in Britain's favour. According to figures for the first months of the year, the balance in Britain's favour should be about £16,000,000.

For some time Belgium had derived benefit from the export of large quantities of iron and steel to Britain. Now that production of these commodities had greatly increased in the United Kingdom, there had been a big change and exports, which in 1952 had amounted to £28.000,000, would probably not extend in the current year beyond £4,500,000. Development of British trade with Belgium showed the intention of Britain to make the pace and make it fast. Motor-car exports to Belgium in 1952 were about £4,500,000. The figure would probably be about the same this year, but electrical goods would probably increase by about 50 per cent. and chemicals should increase from under £3,000,000 to £4,500,000.

THE FARADAY MEDAL, the highest award of the Institution of Electrical Engineers, was presented last week to Mr. Isaac Shoenberg for his contributions to the deve'opment of television in this country. As leader of the team of scientists engaged on research for Electric & Musical Industries, Limited, Mr. Shoenberg developed the method of cathode-ray tube scanning for television, which was adopted by the B.B.C. in 1936. His development of the electronic picture tube known as the Emitron contributed perhaps more than any other single item to the success of this system.

Council of Ironfoundry Associations

Annual Report on 1953 *Activities*

The Council of Ironfoundry Associations entered its twelfth year in 1953, and acted for the ironfounding industry in a number of important matters, several of them arising from the close relationship between Government and industry which has conspicuously marked the post-war years. What follow are extracts from the Council's annual report issued recently:—

Iron and Steel Act, 1953

The C.F.A. report for 1952 recorded the Government's intention to return the Iron and Steel Industry to private ownership and to introduce a form of supervision which would remove the industry from the arena of party politics. Despite considerable opposition to its proposals to include iron castings in the scope of such supervision, the Government refused to leave them out, but on the representations of the Joint Iron Council and other employers' associations in the engineering industry it introduced amendments intended to remove the major objections. By the time the Bill received the Royal Assent in May, 1953, and passed into law, the following changes had been made:—

(1) Foundry development schemes would be subject to the supervisory powers of the Iron and Steel Board which was to be set up under the Act.

(2) The Board's powers to control prices would not extend to iron castings unless specified conditions of monopoly existed in any class of castings, and the producers concerned could not satisfy the Board that the prices charged were reasonable. Even where such conditions existed an Order by the Ministry of Supply, subject to annulment by either House of Parliament, would be necessary.

(3) The Board's powers to obtain information were limited to those necessary for its work; the penalties were drastically modified. Information on costs could only be demanded when the Board's price-fixing powers were used.

The Iron and Steel Board and the Iron and Steel Holding and Realization Agency began work on July 13, 1953. The Council had represented to the Minister of Supply that the Board should include a member with ironfounding experience, and the executive noted with satisfaction that Mr. James Shaw, chairman of Allied Ironfounders, Limited, had been appointed as a part-time member of the Board.

Since the Board's appointment, the chairman and other members of the C.F.A. executive have joined other representatives of the Joint Iron Council in several discussions with the permanent members of the Board, and it has been agreed that there should be regular discussions in the future. Up to the present these talks have been about general matters, including the collection of ironfounding statistics by the Board. The representatives have told the Board of some of the urgent financial problems relating to the provision of research, education and other development work, the adequacy of which is a statutory responsibility of the Board. It is obviously important that the industry should demonstrate to the Board its ability to provide and conduct these collective services. In turn this means that all ironfounders should co-operate, through their associations, in the work of a strong and truly representative Council.

Joint Iron Council

The C.F.A. and the Council of Iron Producers are equally represented in the Joint Iron Council. The activities of the J.I.C. in the twelve months ended June 30, 1953, were fully reported in its ninth annual report, distributed to all member-firms last October. The J.I.C.'s convention was held in London on November 3, and it was encouraging to the executive, and to the other representatives who serve on the J.I.C. executive committee, that the event was so well attended by representatives of the ironfounding industry. At the morning business meeting the annual report was discussed. Employers' liability assurance in the iron industry was the subject of the afternoon session. The disturbing increase in the number of claims on employers and the attitude of the insurance companies were frankly debated. The banquet in the evening was attended by more than 400, among them the Minister of Supply (Mr. Duncan Sandys) as the principal guest, and many other public figures. The Joint Iron Council provides substantial funds for research, education and similar development work. The calls on its resources have steadily increased in recent years, and considerable thought is being given to ways in which an adequate income can be assured.

Modernization of Iron Foundries

During 1953, the control of capital expenditure through the Government's system of issuing licences for industrial building was steadily relaxed. Since 1948 the Steering Committee of the Joint Iron Council has assisted nearly 800 member-firms to obtain the necessary authority to modernize, extend or rebuild their iron foundries Most of the urgent schemes of re-organization and expansion have been completed; together they represent a remarkable accomplishment on the part of the ironfounding industry in adopting modern plant and methods and in providing the best possible working conditions. With the recent changes in the state of trade, managements have been careful before deciding to embark on large schemes; this is shown by the number and size of building applications sponsored by the Ministry of Supply in

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1953. The Ministry was called upon to approve twelve applications from iron foundries, with an estimated building expenditure of £266,522 (these figures do not include the numerous small schemes which did not require to be licensed). From October, 1946 (when the first Iron and Steel Board began the investigation of ironfounding schemes) up to December 31, 1953, the authorized expenditure of the ironfounding industry on licensed schemes of modernization and amenities is estimated to be £18,549,219.

Iron and Steel Foundries Regulations, 1953

Last year's C.F.A. report referred to the draft Iron and Steel Foundries Regulations which had been published by the Ministry of Labour in January, 1953, shortly after the withdrawal of a Parliamentary Bill (the Foundry Workers (Health and Safety) Bill) which had been given a second reading in the House of Commons. The draft Regulations followed the lines of the Bill fairly closely. The *ad hoc* committee appointed by the Council to consider the draft and submit comments to the Ministry on behalf of employers had a long and strenuous task. The committee collaborated closely with the constituent Associations and with the other foundry employers' organizations. A great many objections and proposed amendments were lodged with the Ministry after they had been submitted to all member-firms. Several discussions with the Ministry's officials followed, and a revised draft of the Regulations was published in August. Copies of this revision with an explanation of the changes which the Ministry had agreed to accept were sent by the C.F.A. to member-firms, and after further negotiations and amendments the Regulations in their final form were published in October, 1953.

The main body of the Regulations came into effect on January 1, 1954, but the two clauses which deal with dust and fumes and with bathing facilities will not operate until January 1, 1956. The long-term effect of the Regulations on the industry cannot be forecast. Some of the smaller or older foundries may well find it extremely onerous or difficult to comply with all of the requirements, and there are technical problems in dust control to which solutions have yet to be found. The C.F.A. will pay special attention to the way in which the Regulations are interpreted and it included this subject in the programme of its safety conference (held in March, 1954). The provision of spats and leggings, of safety boots (at cost price), and the issue of towels are matters still under discussion between the employers' organizations and the Ministry of Labour. The events leading up to the introduction of the draft Regulations afford a striking example of how political actions now affect the affairs of industry, and how important it is for employers to maintain a strong national organization to protect their interests.

Health and Safety in Ironfoundries

Safety Committee

In 1952, the Council decided to set up a standing committee on Safety in Ironfoundries. A conference for member-firms was organized (March, 1954). The committee will pay special attention to the forms of accident prevention organization most likely to interest employers in their efforts to reduce the number of accidents occurring in foundries. In the post-war years, member-firms have given considerable thought to industrial safety, and by the modification of premises, machinery and processes, a great deal has been done to eliminate risks. Protection of the individual by the provision of suitable clothing has also received great attention; but the promotion of safety consciousness and a sense of responsibility in the individual will remain as a standing problem. In some foundries, joint safety committees have worked successfully. The committee is considering the preparation of a code of safe working practices which will be useful to managers and foremen and others responsible for the training and safety of young persons. A number of parliamentary questions have been asked about the standards of health and safety in ironfoundries compared with other sections of industry. The question of employers' liability has attracted attention because of the mounting number of claims at Common Law, and the C.F.A. executive committee has considered whether changes in the law are not now required to give the employers better chances of defending themselves against such claims. The Safety in Employment (Inspection and Safety Organization) Bill was due to be debated in the House of Commons in February, 1954, and the executive arranged for the proposals to be examined at the earliest possible date.

Joint Standing Committee on Conditions in Ironfoundries

The Joint Standing Committee on Conditions in Ironfoundries (on which the Council is represented) held a number of meetings in 1953, but most of its work was overshadowed by the industry's preoccupation with the draft Iron and Steel Foundries Regulations.

Output

The unbroken increases in production which the industry had achieved since 1945 ceased in 1953. The decline from the peak year of 1952 was slight —only 3.2 per cent. less—and the output was higher than in any of the years 1945-1950. Statistics show that some sections of the industry escaped the recession completely, and were even able to make new records. In interpreting Table I, which shows the relative importance of the main sections of the industry, it should be remembered that the overall trend of output was downwards in the first half of the year, with a recovery in the last quarter. The proportion of building and domestic castings improved steadily throughout the year, and the automobile and ingot-mould sections

also showed increases in every quarter but the last. The decline which had marked engineering and jobbing was reversed in the last quarter; this welcome revival was widely spread among the numerous headings of engineering and jobbing output.

TABLE I.—*Percentage Composition of Iron Castings Production during* 1953.

	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Automobile	7.0	7.3	7.9	7.7
Building and domestic	14.6	14.7	15.3	15.7
Pipes	18.8	18.9	18.6	18.8
Engineering and jobbing	40.8	39.2	38.5	38.8
Ingot moulds	9.9	10.4	11.0	10.0
Railway equipment	8.9	9.5	8.7	9.0
Total	100.0	100.0	100.0	100.0
Malleable iron (as a percentage of total)	3.7	3.7	3.6	3.7

Raw Materials

Raw materials were plentiful in 1953, partly because of slightly lessened demand from the ironfoundries. The removal or relaxation of various Government controls has been appreciated by the industry. The rising cost of some of the principal raw materials has been criticized and has caused anxiety about the ability to compete in the export markets; but the rises all go back to the costs of coal and transport, and in respect of both of these the Council has joined with the rest of industry in protesting against further increases. Under Section 3 (1) of the Iron and Steel Act the Board has the duty to keep under review the distribution of raw materials and fuel used in the iron and steel industry, and under Section 3 (2) may act as agent for the Minister of Supply in any of his functions as far as they relate to raw materials.

Pig-iron

Apart from occasional and minor difficulties in hematite, the supply of foundry pig-iron has been adequate for all needs. The C.F.A. does not know of any foundry where the output has been restricted because of shortages. The control of pig-iron distribution by licensing was ended in November. Maximum price determinations for foundry pig-iron were published by the Iron and Steel Board in December, 1953. The amount of pig-iron charged by ironfoundries in 1953 was 2,336,890 tons (compared with 2,433,468 tons in 1952 (53 weeks)), and receipts amounted to 2,395,264 tons (compared with 2,490,000 tons in 1952). The stocks at foundries rose from 189,817 tons to 252,854 tons over the year, ending at the average level of 5.6 weeks' consumption.

Scrap

Scrap iron and steel is still licensed. It is likely to remain so until the Iron and Steel Board (which now acts as the agent for the Minister of Supply issuing scrap licences) is sure that supplies warrant the abandonment of this control. The scrap drive conducted by the British Iron and Steel Federation ended on December 31, 1953, because the emergency existing when the drive began has temporarily been overcome; but the iron and steel industry generally still relies upon large imports of scrap, and member-firms will be well advised to continue to make the maximum possible use of home resources.

The receipts of scrap iron and steel by iron foundries in 1953 amounted to 1,396,092 tons, compared with 1,419,143 tons in 1952 (53 weeks). The total amount of scrap charged (including "own arisings") was 2,786,414 tons, against the 1952 figure of 2,979,276 tons. The stock at ironfoundries at the beginning of the year was 182,405 tons, and at the end of the year was 190,287 tons, equivalent to about seven weeks' consumption. At the year-end, changes in the scrap-licensing arrangements were introduced. Licences will now be issued at six-monthly intervals instead of quarterly, and the basis of the licence will be current consumption plus a stock allowance of six weeks' consumption less the amount of stock held at the beginning of a licensing period. Some flexibility is allowed, as any ironfounder who requires a greater amount of scrap can apply for his licence to be amended. Since the year-end an Order amending the 1952 Iron and Steel Scrap Order has been made, which relates to the reduction which must be made from the scheduled maximum prices when a buyer uses his own road vehicles to collect scrap.

Ferro-alloys

The alloy-additions panel of the Joint Iron Council has kept under review the supply position of ferro-alloys. From January 1, 1953, individuals were again at liberty to import and distribute ferro-silicon, as world supplies had improved, but the central purchasing arrangement operated by the British Iron and Steel Federation was continued, as it appeared to offer advantages to consumers. The central purchase of ferro-silicon is expected to end in June, 1954. The restrictions in the use of nickel ceased towards the end of the year.

Coke

Foundry coke supplies were sufficient for ironfounders. Total consumption of coke of all qualities (except breeze) was 1,028,000 tons which was 9.2 per cent. below the 1952 rate. Early in the year, the Ministry of Supply made inquiries into the use of Durham coke by Scottish ironfoundries. The Ministry was satisfied that this grade of coke was essential, for technical reasons, in the production of many types of engineering castings. Some dissatisfaction is still felt about the quality of cupola coke. The Institute of British Foundrymen is setting up a technical sub-committee to consider some aspects of this subject and the C.F.A. has been invited to nominate a representative. The Ministry of Fuel and Power has asked the British Productivity Council to set up a National Industrial Fuel Efficiency Service, which will be a non-profit making company. As briefly stated in last year's Report, representatives of the Council were interviewed by the Minister's Fuel Efficiency Advisory Committee on the collective action taken in the ironfoundry industry to promote the efficient use of foundry coke and other fuels.

Miscellaneous

The right to quarry recently-discovered deposits

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of silica sand in the Congleton area has been the subject of a public inquiry at Sandbach, when an appeal was made against the refusal of the local planning authority to grant permission. Evidence was given on behalf of some of the Council's constituent associations. The result of the appeal has not yet been announced.*

On the recommendation of the Market Development Committee, the Council authorized a Press advertising campaign as part of its work to retain the existing markets for grey and malleable cast iron, and to develop new markets. The competition from alternative materials of construction had caused much anxiety in several sections of the iron founding industry. The campaign began in March, 1953. The advertisements were published in a number of carefully selected trade journals and other publications. Money to launch the campaign had been granted by the Joint Iron Council, and was sufficient for it to continue until the end of the year. The value of the advertising and the possibility of its continuance on a similar scale in 1954 were discussed at the J.I.C.'s annual convention in November, and later by the executive and Council. The J.I.C. was willing to make a further grant for advertising on a limited scale in the first half of 1954, but was unable, because of its general financial position, to promise that additional money could be supplied after that. In these circumstances the Council reluctantly decided that the wise course was to suspend Press advertising until sufficient funds could be assured.

The member-firms publicity scheme sponsored by the Council, intended to reinforce the Press advertising, received moderate support. Although the number of firms participating was fewer than had been hoped, the scheme was operated satisfactorily. The last delivery of publicity material will take place in May, 1954. The Executive is ready to renew the scheme if enough support is forthcoming. In 1951, before Press advertising began, the Council had approved a programme of long-term, long-range publicity, built on a buyers' guide and technical reference books, which would not involve immediate or large-scale expenditure. Much preparatory work has been done, and some of these projects can soon be completed by the Council, if the necessary funds can be found.

Development Panel

Although some of the activities of the development panel have been discontinued or suspended at the request of the Council, it continues to encourage and assist the industry to work efficiently and profitably. The panel sponsored the serial publication of 11 articles on "Elements of Foundry Costing," which are sent periodically to all member-firms. The articles have been a success and have revived interest in the Council's costing system. The panel has been disappointed that more headway has not been made in the establishment of local cost comparison groups.

The chairman of the panel advised on the programme of the joint C.F.A./B.C.I.R.A. conference on "Simplifying Foundry Operation" which was held at Ashorne Hill in November, and in which so such interest was taken that arrangements were made to repeat the conference (February, 1954). Panel members attended the interview between representatives of the industry and the Ministry of Fuel and Power's Fuel-efficiency Advisory Committee which took place early last year; attention was then drawn to the leaflet "Saving Iron and Coke," which the panel had prepared for the Council and which was distributed widely in many iron foundries.

The services of the operational research team of the British Cast Iron Research Association are available in confidence and without charge to all iron founders. Those who have received visits from the team have spoken highly of the benefits they have derived from its advice. In order that other foundries might be encouraged to invite the team to visit them, the Council has produced a booklet on the team's work which has been distributed throughout the industry. The work of the British Productivity Council has been noted, but as yet no action has been taken to collaborate with the C.F.A. During the year a report was published on the European symposium on foundry productivity held in Paris in 1952. There is a desire on the Continent, among the countries which are members of the Organization for European Economic Co-operation, to set up a liaison committee for the continued exchange of information on this subject, and the United Kingdom has been asked to advise on the constitution of such a body.

Recruitment, Training and Education

Almost from the beginning, the Council has been deeply interested in the recruitment and training of foundry personnel. The devolpment panel's work to bring about the adoption of the Grey Iron-founders Productivity Team's recommendations focussed attention particularly on problems of management training. Following the conference on "Training for Ironfounding," held in 1952, the Council last year appointed a new committee to correlate the activities carried on in the various sections of the industry and in the main iron founding districts. Most of the constituent associations are represented on this committee. One of its first tasks has been to advise the Council on the work which should be done with the support of a grant from Conditional Aid funds. The committee has recommended that a training officer should be appointed.

National Foundry College

The National Foundry College successfully completed its sixth session in the first half of 1952; of the 32 students, all 17 in the Part I course qualified for the Part II course beginning later in the year. The seventh session, 1953/54, opened in September with a record entry of students, 21 taking Part I and the remainder the Part II course. The College took possession of new premises added to the Wolverhampton and Staffordshire Technical College

* Since the issue of this Report, permission has been granted.—EDITOR.

in the autumn; the extensions were officially opened in February, 1954, by the Permanent Secretary of the Ministry of Education. In addition to making a substantial annual grant to the College, the Joint Iron Council has given the sum of £5,000 towards the cost of equipping the new premises.

National Foundry Craft Training Centre

The National Foundry Craft Training Centre at West Bromwich completed the fifth year of its work. About 120 lads from several parts of the country received instruction during the year. Students who successfully complete courses of instruction are presented with certificates. The programme of courses for 1954 has been adjusted to admit more first-year students. The dates for the 1954 courses were announced in October. The Council hopes that member-firms in particular will suport the Centre by sending as many of their young employees as possible for instruction there. The Centre instructor has written a text-book on practical moulding. This was brought to the notice of a publisher by the C.F.A. and will be published during 1954. It should fill a conspicuous gap in foundry literature.

Teaching Aids

The training films and film strips held by the Council have been in constant use by member-firms and by technical schools and colleges. On the C.F.A.'s recommendation, films on foundry practice and patternmaking have been included in the Government's Central Film Library. The Council continues to receive requests from technical colleges for its wall charts on foundry work.

Transport

The Government's proposals to denationalize road transport, set out in the revised Transport Bill, were studied by the transport committee, which was closely in touch with the Traders' Co-ordinating Committee on Transport, the principal body representing the industrial users of road and rail transport. Since the Act was passed, no special problems of transport or Government policy in relation to it have called for separate action by the committee. Nevertheless, the Council has been greatly concerned by an application for a further increase in railway-freight charges. Through the Traders' Co-ordinating Committee it has joined in objections which industry has lodged with the Ministry of Transport.

Relations with Affiliated and Other Associations

British Cast Iron Research Association

The president of the Joint Iron Council (Mr. F. Scopes) was re-elected president of the B.C.I.R.A. in November, 1953. During the year the Association was allocated funds from Conditional Aid for the purpose of increasing industrial productivity. The research programme has been pursued and reports of work done are regularly published. Reference has already been made to the joint C.F.A./B.C.I.R.A. conference on "Simplifying Foundry Operation" and the work of the operational research team, which, since its inception in June, 1950, has paid nearly 450 visits to just over 300 foundries. The foundry atmospheres committee completed work on the discharge of fine dust from grinding wheels, and the new system of exhaust ventilation known as the external dust-control system is now being manufactured for supply to the industry. The foundry atmospheres team is now studying air flow at the foundry knock-out, at which point quantities of dust and steam are normally generated. This work is particularly important in view of regulation 7 of the new Iron and Steel Foundries Regulations.

Institute of British Foundrymen

The Institute of British Foundrymen—celebrating its Jubilee in 1954—has successfully continued its long-established activities. In particular, the technical investigation work through the Institute's Technical Council and the specialized sub-committees has steadily progressed. In the past five years, this work has been considerably extended with the aid of grants from the Joint Iron Council. The last-named body has now taken the full financial responsibility for the Institute's annual scholarship at the National Foundry College.

Foundry Employers' Associations

Throughout the year, the Council has closely collaborated, in matters of common interest, with the Engineering and Allied Employers' National Federation, the National Light Castings Ironfounders' Federation, the British Steel Founders' Association and the Association of Bronze and Brass Founders. The C.F.A. worked on the draft Iron and Steel Foundries Regulations in co-operation with the first three bodies; with the steelfounders and brassfounders it has examined the proposals to establish a European liaison committee on foundry productivity.

Other Organizations

The Council is a member of the Federation of British Industries and of the National Union of Manufacturers and has worked with both organizations in protecting the interests of industrialists. The C.F.A. director serves on the council of each body, and on several of the F.B.I. committees. The Council is represented also on several committees of the British Standards Institution.

Membership of Associations

At the end of 1953, the number of firms recorded as being members of the Council's constituent and affiliated associations was 1,078. According to Government records in September, 1953, the number of ironfounding companies in this country licensed to acquire raw materials was approximately 1,890.

Constitution

A sub-committee appointed by the C.F.A. executive to study the amendment of the constitution has held several meetings and has received a number of valuable suggestions from constituent associations. Several complex matters are still being considered, including finance and voting rights.

Information Services and Miscellanea

The information and Press service has continued on the lines described in the Report for 1952. The

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C.F.A.'s Bulletins are now being issued more frequently to member-firms; a special effort has been made to render them as readable and useful as possible. Periodically information about the ironfounding industry has been supplied to the industrial correspondents of the leading newspapers and the trade and technical journals. Increasingly close personal contact has been made with the Press and the B.B.C. Apart from the obvious value of Press channels for editorial publicity, whenever that may be thought desirable, information helpful in the work of the Council is often to be obtained through them. A tendency is also noticeable for journalists, whether on the newspaper or technical Press, to approach the Council for guidance in matters concerning the industry.

The information and press officer wrote and prepared for publication the operational research team booklet, and assisted with the statistical review, both of which were supplied without charge to member-firms; he has edited also the articles on "Elements of Foundry Costing," has been gathering material for monographs on special applications of iron castings (a long-term project sponsored by the market development committee), and has written a booklet describing the substantial efforts ironfounders have made in the post-war years to improve working conditions and provide amenities.

Taxation

Through the Federation of British Industries and the National Union of Manufacturers, the Council has been informed of the representations made by industry for lightening the tax burden. During the negotiations on the draft Iron and Steel Foundries Regulations, some constituent associations asked whether iron foundries should not be granted taxation relief on the capital expenditure necessary to comply with some of the requirements. At the present time the prospect of securing such concessions is remote, but the Council will continue to seek them.

Census of Production

A committee on the Censuses of Production and Distribution was set up to advise the President of the Board of Trade, and on behalf of the iron industry the Joint Iron Council has submitted evidence to the committee, pointing out that some of the Census of Production statistics on iron castings are either incomplete or are out of date by the time they are published, and that in any event much more detailed information has been collected by the Ministry of Supply (and now by the Iron and Steel Board). The Council has lodged a strong objection to the draft form for the 1954 Census of Production which the Board of Trade proposes to send to iron foundries.

Coronation

On the occasion of the coronation of H.M. Queen Elizabeth II, the Council sent to her a loyal and dutiful address on behalf of all member-firms, for which Her Majesty graciously expressed thanks.

The Modern University and Local Industry

(*Continued from page* 558)

Lavoisier's classical overthrow of the phlogiston theory at the end of the eighteenth century and his establishment of the principles of gaseous combustion arose from his active interest in the problem of lighting the streets of Paris by gas. A quarter of a century later, Humphrey Davy established the background of all subsequent researches into flames and explosions, *e.g.*, ignition phenomena, catalytic combustion, etc., when he developed the miners' safety lamp. He was asked to undertake this problem by a society formed in Sunderland after a disastrous pit explosion at Jarrow.

The Mond process for nickel extraction began when Ludwig Mond was given the problem of finding the cause of nickel contamination in a works process. Pfeil's work in which he produced the first large single crystal of iron was the result of an examination of certain failures in a deep drawing operation at a local works.

Even in his own experience Professor Preece referred to instances where attempts to solve a works problem had opened up interesting fields in fundamental research. Much trouble was experienced during the early part of the last war in the manufacture of track-links for armoured vehicles. Sometimes during the malleablizing operation, the surface of the casting became embrittled due to the formation of a band of sulphide or a mixture of sulphide and oxide, some distance below the surface. Apart from solving the particular problem this work gave some insight into: The movement of a film of a liquid phase through solid iron; the influence of $C_2H_2N_2$ on the solubility of sulphur in solid iron and how one interstitial element like S could influence the segregation of carbon. Fundamental work along these lines is still proceeding at both Leeds University and King's College.

Another problem concerned the overheating of steel. This was particularly important in the forging of aero-engine crankshafts. Production in the early part of the war had to be greatly increased with inadequate furnace capacity, and it was necessary to use furnaces not designed for the type of work. This led occasionally to the production of faulty materials and the rejection of components much needed. In working towards a solution of this problem, much information was brought to light on the high-temperature segregation of iron and manganese sulphide in steels, and this work is being followed up as studies of grain-boundary segregation in polycrystalline metals in a number of laboratories.

This two-way traffic between science and industry was, he concluded, one in which the universities were anxious to take part. Collaboration of this nature between universities and local industry had the further advantage of often being the quickest way of translating scientific discovery into technical achievement. This was extremely important in the fight against foreign competition.

Notes from the Branches

London—Annual General Meeting

At the annual general meeting of the London branch of the Institute of British Foundrymen held recently, the secretary, Mr. W. G. Mochrie, presented his report on the session's activities, in the course of which he said:—

This meeting marks the close of yet another session of the branch, with its customary full programme of technical sessions, social events, both official and unofficial. To recapitulate, the work included:—

Technical.—The branch itself has had eight monthly meetings:—September 30: presidential address by Mr. B. Levy, followed by "New Methods for Old," by Mr. F. Hudson; October 28: "Shell Moulding," by Mr. A. Emmerson; November 11: "Patternmaking and Storing," by Mr. A. Talbot; December 2: "Bell Founding," by Mr. H. M. Howard; January 27: "Cast Iron *apropos* Enamelling," by Mr. A. Adam; February 24: "Propeller Manufacture," by Mr. J. M. Langham; March 31: "Any Questions?" with Mr. G. Pierce as chairman; and April 28: "Dust Extraction," by Mr. W. B. Lawrie.

Average attendance was 134 at each meeting, an increase of 23 over last year's figure. In addition, the East Anglian section accounted for seven meetings, Slough six, Southampton six, and Beds./Herts. eight. The Southampton section, now completing its second year, is going from strength to strength.

This is the first annual report in which the Beds./Herts. section has appeared. Its Council, formed only towards the end of last summer, must be congratulated on the results of their efforts in the attendances at their meetings. The interest they have aroused in local foundrymen is reflected in their mailing list, to which over 100 new members have been added.

Works Visits.—Owing to the annual function for works visits on a national basis, the London branch for the last two years or so has not organized a local works visit programme. Advantage has been taken by members to attend the national function, which last year was by invitation of the East Midlands branch.

Continental.—A representative party from the London branch attended the International Foundry Conference in Paris in the autumn of last year.

Membership.—The following is a summary of membership statistics for the year:—

	S.F.	M.	A.M.	A.	Total.
1953 Figures	35	406	316	82	839
Transferred to the branch	—	1	9	3	13
New applications	—	45	42	20	107
	35	452	367	105	959
Less transfers from the branch	—	3	6	2—11	—
Resignation, erasures, deaths, etc.	2	21	16	4—43	54
	33	428	345	99	905

Subscriptions for the year amounted to £2,380 8s. 8d. The fact that London is the largest branch in the Institute, and possibly the greatest body of qualified foundrymen in the world, may in itself be of little consequence, but it does indicate what the Institute has to offer foundrymen in the area served by the branch.

Social.—The dinner/dance, in November, organized by Mr. A. R. Parkes, was again an unqualified success, the occasion being marked by the official visit of the (national) president, Mr. E. Longden, M.I.MECH.E., together with the secretary, Mr. T. Makemson, M.B.E. The "Stag" party in the Horse Shoe Hotel in March reflected again on the wizardry of the assistant secretary, who accommodated still more than the record number of last year.

A special feature of the session was the entertaining, on behalf of the Institute, of three parties of American foundrymen, who spent a few days in this country, either before or after the International Conference in Paris. Works visits were organized for them and the major party was entertained to cocktails on board the Wellington, which was followed by dinner at the Savoy for the officials of the A.F.S.

Distinctions to Members.—Since the last annual general meeting members have congratulated Dr. A. B. Everest on becoming the junior vice-president of the Institute, and are looking forward to giving him their support during his year of presidency if events take their natural course during next year, when the International Congress will be held in London. Congratulations are proffered to Mr. N. Y. Newton, who gained first prize in the branch in the Jubilee Competition. (The cheque was presented to him during the evening's proceedings.—ED.)

There have been four meetings of the branch Council this session, together with various sub-committee meetings. Branch representatives have attended four general Council meetings. Our representative on the Technical Committee of the Institute, Mr. F. Hudson, will be making his report.

Programme for Next Session.—Although the work of the 1953-54 session would appear to have been concluded, the programme committee is already considering suggestions for the session next year; in this connection members' views are sought.

National Conference.—This year, the national conference of the Institute is scheduled for Glasgow, under the presidency of Mr. John Bell. Reports already received show that the branch will be well represented.

Then followed the report of the work of the Technical Council of the Institute. Mr. F. Hudson, the branch's representative on this Council, gave a summary of the year's work of the various sub-committees and of progress made, and intimated that the full report will be presented at the annual meeting in Glasgow.

Election of Officers

The next item on the agenda was the election of officers for the branch for the 1954-55 session and the following were chosen:—As *president*, Mr. W. Wilson; as *senior vice-president*, Mr. F. Hudson; as *junior vice-president*, Mr. M. Glenny; and as *honorary secretary*, Mr. W. G. Mochrie (re-elected). The *honorary auditors*, Mr. V. Delport and Mr. Barrington Hooper, were re-elected, and vacancies on the *branch Council* were filled by Mr. Bartlett, Mr. Daybell, Mr. Parkes, and Mr. Wizard. Representatives of the branch on *General Council*, Mr. Barrington Hooper, Mr. Glenny, Mr. F. A. Wilson, and Mr. Beresford, were re-elected *en bloc*, and Mr. W. G. Mochrie was chosen to represent the branch on the Technical Council. The stewards and projectionist were warmly thanked for their services and re-elected.

Following the conclusion of the annual meeting, Mr. W. B. Lawrie, of the Factory Department of the Ministry of Labour and National Service, presented four films on recent aspects of the problem of dust control in foundries. These related to stand-grinder ventilation and the extension of recent trends of design in this direction to a number of portable appliances used in the foundry. It will be remembered that the London branch have in recent years provided the forum at which many of these developments in improved foundry hygiene have been first discussed.

Personal

MR. E. F. HUCKVALE, who has been for more than 25 years secretary of Jaguar Cars, Limited, Coventry, has been appointed a director.

MR. MILES BEEVOR, managing director of the Brush group, left by air on Sunday to visit Ceylon, Singapore, Australia, and Canada.

MR. J. R. GREENWOOD, chairman of Craven Brothers (Manchester), Limited, has been appointed director and deputy chairman of Crossley Motors, Limited, of Stockport.

COUN. W. CHAMBERS, managing director of Clayton-Chambers, Limited, steam installation engineers, of Leeds, has been elected president of the Leeds Association of Engineers.

LORD LUKE has been re-elected chairman of the London Chamber of Commerce. He is chairman of several companies, including the Wallis Tin Stamping Company, Limited, Poole (Dorset).

MR. A. J. BUDD, assistant superintendent of the motor department, has been appointed assistant superintendent of the Leonard Works of Metropolitan-Vickers Electrical Company, Limited.

MR. F. B. DIXON has resigned his position as purchase manager of the Ford Motor Company, Limited, Dagenham. He has also resigned his directorships of Briggs Motor Bodies, Limited, and British Indestructo Glass, Limited.

MR. ERNEST D. HINCHLIFFE, managing director of Hills (West Bromwich), Limited, is on a business trip to Canada, to visit particularly Toronto and Vancouver. In both cities it is intended to form new concerns to further the company's exports.

MR. JOHN R. PATE, joint managing director of the Anderson-Grice Company, Limited, of Carnoustie, has left for a tour of the chief centres of the stone and marble industry in Canada and U.S.A., with the object of increasing his firm's business.

MR. RALPH D. PARKER has been appointed general manager of Canadian operations of the International Nickel Company of Canada, Limited, in succession to MR. J. ROY GORDON, a director, who is transferring from Copper Cliff to New York.

THE INTERNATIONAL NICKEL COMPANY OF CANADA, LIMITED, announce that Mr. Ralph D. Parker has succeeded Mr. J. Roy Gordon as general manager of Canadian operations. Mr. Gordon, a director of the company, is transferring from Copper Cliff to New York City.

MR. FRANK A. HURST and MR. F. SCHNORF, directors of the Anglo-Swiss Aluminium Company, Limited, of Queen Street, Sheffield, have resigned from the Boards of the South Wales Aluminium Company, Limited, and Reynolds Rolling Mills, Limited. Mr. Hurst is also chairman and managing director of Samuel Osborn & Company, Limited, Sheffield.

MR. N. BAINES, London representative of W. Tyzack Sons & Turner, Limited, tool manufacturers, of Sheffield, has been elected chairman of Middlesex County Council. Mr. Baines, who is 56, has been on the council since 1942, and for two years was leader of the majority party. Recently he served as chairman of the General Purposes Committee.

MR. C. F. BARNARD has been appointed joint managing director of Associated British Oil Engines (Marine), with Mr. J. Jones. Mr. Barnard has been managing director of Mirrlees Bickerton & Day, Limited, since October, 1953, a position which he retains. Mr. Jones is also managing director of The National Gas & Oil Engine Company, Limited.

MR. GEORGE BOEX will be retiring from his joint managing directorship of the British Aluminium Company, Limited, on July 4, when he will reach the retiring age. He will be succeeded by MR. W. J. THOMAS. Mr. Boex, who will remain a director of the company, has agreed to carry out any special work as a consultant which the board may ask him to undertake.

THE CERTIFICATE of honorary membership of the Institution of Electrical Engineers was presented to Mr. Ernest Leete for his outstanding services to the Institution, in particular as honorary treasurer and as an ordinary member of council over a period of almost 25 years, and also for his work on behalf of the benevolent fund over a similar period of years. Mr. Leete was born in 1886. In 1904 he accepted an appointment with the London Electric Wire Company & Smiths, Limited, being subsequently appointed secretary, a director, managing director, and consultant. He served as chairman of the Cable Makers' Association in 1928. Mr. Leete was first elected to membership of the I.E.E. in 1917, and was elected a companion in 1929.

Obituary

MR. JOHN ROWBOTTOM LONG, who has died in the Scunthorpe Hospital at the age of 67, was for many years blast-furnace manager at the Appleby-Frodingham works, Scunthorpe. He had been associated with the company for over 50 years.

MR. HENRY HERBERT SMITH, formerly chief cost accountant, at Ley's Malleable Castings Company, Limited, Derby, has died at the age of 83. He had been associated with the firm for 50 years.

DR. JABEZ EDWARD SIXSMITH, joint managing director of the Chatwood Safe & Engineering Company, Limited, Shrewsbury, has died at the age of 76. He had been with the company for 39 years.

MR. CHARLES MACFARLANE, who was works manager of George Clark (1938), Limited, marine engineers and boilermakers, of Sunderland, from 1906 until his retirement in 1938, has died at the age of 87. He spent 58 years at the engineworks, having started as an apprentice fitter when he was 14.

Attracting Arts Graduates to Industry

Sheffield Chamber of Commerce is to set up a panel of industrialists and others to help arts graduates to find jobs in industry. So far, between 30 and 40 industrialists and senior executives have volunteered for the board. They represent the iron and steel, engineering, cutlery, tool, and other industries, and commerce. The panel, which follows discussions between the Chamber, the Vice-Chancellor of Sheffield University, Dr. J. M. Whittaker, and the university appointments officer, Mr. E. A. Owens, will probably start work next term advising students about to graduate.

The plan has been formulated with a view to attracting more graduates to Sheffield industry, and the students will be sent to a member of the panel in the industry they contemplate entering. Every year about 100 men graduate in arts subjects at Sheffield University and about 20 of these will be affected by the scheme.

News in Brief

IRON-ORE PRODUCTION of Spain rose to 3,887,400 tons in 1953 from 3,850,000 tons in 1952.

THE Jones & Laughlin Steel Corporation, of Pittsburgh, is to develop new iron-ore finds near Kirkland Lake, northern Ontario.

MR. H. P. HUGHES has been recently appointed works manager of the British Electro Metallurgical Company, a Division of Union Carbide, Limited.

THIRTY EMPLOYEES from the steelworks of Steel, Peech & Tozer have chosen Switzerland for their holiday this year. They are all under 18 years old.

THE SPORTS CLUB of the English Steel Corporation, Limited, Bellhouse Road, Sheffield, has nearly 200 life members, whose ages range from 65 to 87.

CONSTRUCTION by the Tees Side Bridge & Engineering Works, Limited, Middlesbrough, of all-welded barges has ceased owing to a lack of orders.

THE improvement of human relations in industry is one of the main objects of a trust which has been established as a memorial to the late Sir Stafford Cripps.

MR. A. B. WARING, chairman and managing director of Joseph Lucas (Industries), Limited, has been nominated as president of the Society of Motor Manufacturers and Traders.

ALGERIAN IRON-ORE PRODUCTION rose to 3,364,400 tons in 1953 from 3,085,200 tons in 1952. Exports last year totalled 3,210,500 tons, compared with 3,037,200 tons in 1952.

BRITISH RESIN PRODUCTS, LIMITED, 21, St. James's Square, London, S.W.1, announce that from May 17, their address will be Devonshire House, Piccadilly, London, W.1 (telephone number Mayfair 8867).

IMPORTS of iron and manganese ore into the United Kingdom during the first quarter of this year amounted to 2,824,000 tons, according to B.I.S.C. (Ore), Limited, This compares with 2,246,000 tons in the corresponding period of 1953.

INCREASED ARRIVALS of iron ore, scrap, and coal raised the March total of imports into the River Tees to 399,229 tons—60,812 tons more than in the previous month. The March export tonnage was 148,031 tons, which was 19,766 tons above the February figure.

AT A MEETING in Stockholm last week, the British-Swedish Chamber of Commerce was formally inaugurated and is expected to be in full operation by the end of the summer. Already some 250 firms in the United Kingdom have indicated their willingness to join.

THERE ARE 200 vacancies in firms in the engineering industry in the Chesterfield district and half of these have come about in the last month because of an improvement of trade. These figures are quoted by the Chesterfield and District Local Employment Committee.

THE Federation of Light Metal Smelters announces that its members' average selling prices (to the nearest 10s.) for the following alloys during the month of March have been calculated as follows:—LM1, £143 10s. per ton; LM2, £153 10s.; LM4, £160 10s.; LM6, £183.

MORE WORKERS, both men and women, are being taken on at the Attercliffe Common works, Sheffield, of Metropolitan-Vickers Electrical Company, Limited, to carry out part of a contract for Eire Railways. No fewer than 496 traction motors are to be made for the axles of the 94 Diesel/electric locomotives.

A PLANER manufactured by William Whiteley & Sons, Limited, Prospect Ironworks, Lockwood, Huddersfield, which is claimed to be the first of its kind to be made in England and designed to fill the gap in the range of manufacture between low- and high-speed machines, is being taken to Canada.

A QUARTERLY DIVIDEND of $1.25 has been declared by the Bethlehem Steel Corporation. Except in the previous quarter, when $2 was paid, quarterly dividends of $1 had been disbursed since March, 1951. Earnings were $2.73 a share on the common shares in the quarter ended March 31, 1954, against $3.06 in the March quarter of 1953.

FROM MONDAY the address of the head and registered offices of Associated British Engineering, Limited, will be 9-10, Cavendish Square, London, W.1 (telephone: LANgham 8351). The London sales office of Meadows, Limited, the Bergius Company, Limited, A. C. Morrison (Engineers), Limited, and H. Widdop & Company, Limited, will also be at this address.

MR. F. SCOPES, managing director of the Stanton Ironworks Company, Limited, presented cheques and certificates from the firm's Foremen's Association to two retiring foremen at the association's annual smoking concert at the Club House, Stanton, on May 7. They were Mr. L. Spencer, who served the firm for 50 years, and Mr. C. G. Reid, who had completed 34 years' service.

THE BRUSH GROUP of engineering companies has secured a contract worth over £1,300,000 for Diesel generating sets in a wide range, for electrification of rural areas in Siam. The 239 Diesel engines required will be produced by Mirrlees, Bickerton & Day, Limited, of Stockport, and J. & H. McLaren, Limited, of Leeds. Brush Electrical Engineering Company, Limited, of Loughborough and Cardiff, will provide the electrical equipment.

GIRLING, LIMITED, Birmingham, have secured a contract to supply Alfa Romeo with brakes and dampers. These components will be for the new Giulietta 1300 Sprint, a coupé capable of more than 100 m.p.h., and for the Romeo, the camping car with seats for nine. The Giulietta, it is understood, is the forerunner of a series saloon model to be made on mass-production lines. The value of the contract to Girling, Limited, is therefore considerable.

THE FIRST SOD on the site of a new reactor at Harwell was cut by Sir John Cockcroft, Director of the Atomic Energy Research Establishment, on Monday. This will be the fourth pile to be built at Harwell and the first in this country using heavy water as a moderator. General design of the pile is being undertaken by the establishment, while detailed design and provision of reactor components will be a responsibility of Head, Wrightson Processes, Limited.

DURING the joint meeting of the *Société Française de Métallurgie* and the Institute of Metals, 35 members of an Anglo-French party visited the new Crawley works of the A.P.V. Company, Limited, and the adjacent stainless steel and aluminium foundries of A.P.V.-Paramount, Limited. Prior to the tour the party was welcomed, at a luncheon, by Dr. Richard Seligman, the chairman. Among the visitors were many with whom Dr. Seligman had collaborated when aluminium and stainless steel were first used for the welded fabrication of industrial plant.

News in Brief

EWBANK & PARTNERS, LIMITED, engineering consultants, of London, S.W.1, is setting up in Canada an associated company, Ewbank & Partners (Canada), Limited, with headquarters in Toronto. The new company will be under the general direction of Mr. J. T. Moore, a director of the parent company, and until recently chief engineer of the English Electric Company, Limited. The Canadian company will operate in close association with Crippen Wright Engineering, Vancouver, engineering consultants in the hydro and civil engineering fields.

YOUNG MEMBERS of the Staffordshire Iron and Steel Institute, forming the associate section, have decided to maintain the section in spite of the decision taken recently at the annual meeting of the Institute that a separate programme for the associate section be discontinued owing to a "very noticeable lack of interest and enthusiasm." Newly-elected officers of the associate section intend to revive interest and carry out an effective and varied programme of activities. They are: *Chairman,* Mr. R. B. Lane; *vice-chairman,* Mr. M. L. Bellingham; and *secretary,* Mr. N. F. Truman.

THE BIGGEST and most varied exhibition of railway equipment held in this country since the war is to be staged by British Railways and London Transport at Willesden Motive Power Depot, Goodall Street, Old Oak Lane, London, N.W.10, from Tuesday, May 25, to Saturday, May 29. The exhibition, which is designed to display Britain's progress in railway equipment to the 500 delegates who will be attending the International Railway Congress in London, will also be open to the general public between 3 p.m. and 7 p.m. on May 26, and from 10 a.m. to 7 p.m. daily on May 27 to 29 (admission, adults 1s., children 6d.).

A SETTLEMENT has been reached in the action taken last year by the U.S. Department of Justice to cancel a contract for the sale by Aluminium, Limited, of 600,000 tons of Canadian aluminium to the Aluminium Company of America in the years 1953 to 1958. A consent order entered by the U.S. District Court in New York has dismissed the petition filed by the U.S. Government last July and deliveries under the contract will continue without threat of interruption. The Justice Department had charged that the contract gave Aluminium of America competitive advantages and threatened to impair competitive conditions in the U.S. aluminium industry.

AN EXHIBITION of wall charts and other visual aids was held last week at Parsons' Gallery, 70, Grosvenor Street, London, W.1, by the Illustrated Classroom Education Company, Limited. Among the exhibits were training charts designed for oil and chemical organizations and other major industrial concerns, and posters impressing the importance of safety on factory workers. Those dealing with eye protection and incorporating such mottoes as "You too can wear an eyeshield" and "Be wise, protect your eyes—wear your goggles," were among the most striking. There was also a "safety creed":—"No job is so important and no service so urgent that we cannot find time to perform our work safely."

A GENERAL MEETING of the Institute of Metals will be held at 4, Grosvenor Gardens, London, S.W.1, on Thursday, May 27, at 5.30 p.m., when a lecture entitled "Lattice Defects and Energy Stored in Deformed Metals" will be given by Dr. W. Boas (head of the Division of Tribophysics, Commonwealth Scientific and Industrial Research Organization, Melbourne. At another general meeting, to be held on Wednesday, June 30, at 5 p.m. (same place), there will be a lecture on "Brittle Fracture of Metals: Some New Developments," given by Professor E. Orowan, F.R.S. (Department of Mechanical Engineering, Massachusetts Institute of Technology). Both meetings will be open to visitors, without ticket.

AT THE annual general meeting of the National Federation of Iron and Steel Merchants, held at the May Fair Hotel, London, W.1, at the end of last month, the independent chairman, Mr. W. H. Lawson, C.B.E., M.A., F.C.A., said that since the Federation had last met, the Iron and Steel Act, 1953, had become law and, on July 13, 1953, the Iron and Steel Board assumed responsibility for supervising the industry. Thus, the first stage of de-nationalization was accomplished. The second stage, that of re-selling the securities of the individual iron and steel companies to private investors, had proceeded less quickly than was expected, and it was difficult to regard the industry as satisfactorily divorced from Government ownership until that second stage had been successfully achieved.

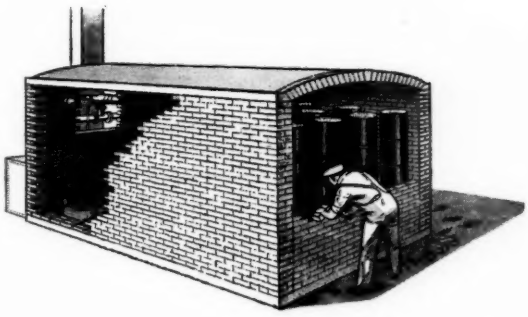
A CONTRACT worth £4,750,000 for the supply of Diesel-electric locomotives to Coras Iompair Eireann (Irish State Transport) has been awarded to the Metropolitan-Vickers Electrical Company, Limited. The contract has been secured in the face of severe competition from American and Continental manufacturers and is the largest order for Diesel locomotives ever placed in Britain. A total of 94 locomotives is to be supplied, 60 of the 1,200-h.p. six-axle type and 34 of the 550-h.p. four-axle type. The electric equipment will be manufactured by Metropolitan-Vickers at Manchester and Sheffield, the Diesel engines by Crossley Bros., Limited, Manchester, and the mechanical parts by the Metropolitan-Cammell Carriage & Wagon Company, Limited, Birmingham.

Exports to the U.S.S.R.

The upsurge in trade with the Soviet Union was the theme of the presidential address of Sir Greville S. Maginness to the Russo-British Chamber of Commerce in London. It had been the practice in former years for the president to report the progress of Anglo-Soviet trade, but in the past four years it had been discontinued, as there had been little of outstanding interest. Sir Greville, who had himself, as chairman of the Churchill Machine Tool Company, Limited, led a trade delegation to Moscow, was able to report that firm orders to the value of between £30,000,000 and £40,000,000 had been placed in Britain by Russian importing organizations since the beginning of this year. These figures, said Sir Greville, included some substantial orders for trawlers, textile machinery, rolling-mill plant, milk-bottling machinery, machine tools, woodworking machinery, Diesel generating sets, switchgear and other electrical equipment, power cables, and many other types of industrial equipment.

The Russo-British Chamber of Commerce is a joint Anglo-Soviet organization, which was incorporated in 1916 under the ægis of the Association of British Chambers of Commerce to which it is affiliated. Consisting of British firms interested in Anglo-Soviet trade, its object is to promote commerce between the British Empire and the U.S.S.R. and party politics of any kind are rigidly excluded. The president is always British and the vice-president Russian, and there are an equal number of British and Russian members on the executive council.

THEY CHANGED TO FUEL OIL



CONVERSION PAID FOR ITSELF IN FOUR MONTHS

A Midland manufacturer of malleable iron castings converted one of his pulverised fuel burning furnaces to oil firing. Each of his furnaces holds 10 tons of castings, with a processing period of five days; the converted furnace has been found to save £2 a ton, and also greatly to improve the quality of the castings. The conversion paid for itself in only four months, and has subsequently saved the manufacturer a thousand pounds a year.

Here is another case where conversion to Esso Fuel Oil has resulted in a marked reduction of fuel costs and improvement in product quality.

Your installation may be particularly suitable for conversion to fuel oil firing. May we arrange for our Technical Representative to call and discuss the matter with you.

It pays to say ESSO **FUEL OILS**

ESSO PETROLEUM COMPANY, LIMITED, 36 QUEEN ANNE'S GATE, LONDON, S.W.1

Imports and Exports of Iron and Steel in March

The following tables, based on Board of Trade returns, gives figures of imports and exports of iron and steel in March. Totals for the first three months of this year and last are also included.

Total Exports of Iron and Steel

Destination.	Month ended March 31.	Three months ended March 31.	
	1954.	1954.	1953.
	Tons.	Tons.	Tons.
Channel Islands	407	1,166	993
Cyprus	350	1,082	3,320
Sierra Leone	1,694	4,441	693
Gold Coast	3,914	10,601	10,357
Nigeria	6,077	15,081	11,154
Union of South Africa	3,288	10,041	39,345
Northern Rhodesia	603	1,496	6,466
Southern Rhodesia	5,215	8,645	10,007
Tanganyika	856	2,821	3,512
Kenya	3,251	17,062	15,166
Uganda	717	2,162	1,330
Mauritius	937	2,384	1,722
Bahrein, Qatar, and Trucial Oman	2,155	8,836	5,134
Kuwait	1,014	2,898	3,065
India	10,503	24,311	12,954
Pakistan	5,715	12,421	8,677
Singapore	2,250	8,891	7,483
Malaya	2,780	6,100	8,091
Ceylon	1,103	4,010	4,519
British North Borneo	375	1,054	1,111
Hongkong	1,176	4,559	6,273
Australia	18,166	48,933	44,538
New Zealand	19,387	42,944	32,294
Canada	20,220	40,760	33,566
Jamaica	1,890	3,643	3,342
Trinidad	4,792	11,335	10,816
British Guiana	374	1,185	1,003
Anglo-Egyptian Sudan	4,974	9,312	6,977
Other Commonwealth countries	3,055	8,366	15,309
Eire	4,515	11,556	10,189
Soviet Union	—	—	2
Finland	6,706	13,043	8,668
Sweden	7,687	21,236	21,463
Norway	5,387	20,798	15,780
Denmark	7,422	23,188	24,020
Western Germany	826	1,572	647
Netherlands	8,626	25,790	31,051
Belgium	1,397	3,023	4,464
France	479	1,299	1,340
Switzerland	1,235	2,485	2,122
Portugal	929	2,792	4,546
Spain	87	736	845
Italy	1,954	11,328	12,788
Austria	125	220	359
Yugoslavia	730	1,140	922
Turkey	408	1,824	2,646
Netherlands Antilles	363	1,222	3,747
Portuguese E. Africa	181	609	904
Lebanon	323	501	1,420
Israel	2,381	3,731	1,718
Egypt	4,606	9,445	4,586
Saudi Arabia	54	591	221
Iraq	2,357	8,029	12,261
Iran	555	1,351	871
Burma	977	2,210	1,321
Thailand	813	1,595	2,074
Indonesia	121	1,643	2,356
Philippine Republic	351	857	591
U.S.A.	3,129	6,968	5,733
Colombia	751	1,912	2,323
Venezuela	4,857	8,453	13,021
Ecuador	152	826	735
Peru	184	863	2,193
Chile	27	323	601
Brazil	—	121	1,153
Uruguay	2,001	4,694	269
Argentina	9,846	19,033	3,761
Other foreign countries	3,362	15,496	7,192
TOTAL	213,142	549,043	520,120

VICKERS-ARMSTRONGS, LIMITED, is building new dock gates for Victoria Docks, London. After being lifted into the water this month, the gates will be towed to the Thames from Tyneside.

Total Imports of Iron and Steel

From	Month ended March 31.	Three months ended March 31.	
	1954.	1954.	1953.
	Tons.	Tons.	Tons.
Canada	222	248	38,407
Other Commonwealth countries and Eire	464	7,390	17,920
Sweden	2,877	10,912	5,602
Norway	1,957	5,756	16,904
Western Germany	25,605	36,261	5,614
Netherlands	10,586	28,889	26,023
Belgium	7,216	17,358	73,189
Luxembourg	2,446	7,515	36,125
France	4,436	25,613	82,610
Italy	2,634	2,663	2,921
Austria	26,576	72,168	100,065
Japan	—	15	31,517
U.S.A.	9,552	28,142	85,364
Other foreign countries	17,528	37,622	18,320
TOTAL	112,099	280,552	540,581
Iron and steel scrap and waste, fit only for the recovery of metal	98,859	215,776	180,336

Exports of Iron and Steel by Product

Product.	Month ended March 31.	Three months ended March 31.	
	1954.	1954.	1953.
	Tons.	Tons.	Tons.
Pig-iron	767	2,551	1,923
Ferro-tungsten	9	72	21
Other ferro-alloys	580	1,167	717
Ingots, blooms, billets, slabs, sheet and tinplate bars	80	1,187	86
Iron bars, rods, and sections	298	639	649
Steel bars, rods, sections, and shapes	26,732	69,219	77,171
Iron plates and sheets	10	278	95
Universal plates	678	1,950	3,786
Steel plates, ⅛ in. and under ¼ in.	615	2,614	1,732
Do., ¼ in. and over	13,998	37,226	56,516
Black sheets and black plate	20,764	62,145	34,715
Hoop and strip	8,860	26,042	12,546
Tinplate	30,113	74,015	74,461
Tinned sheets, terneplate, and terne sheets	316	673	513
Decorated tinplate	317	705	578
Galvanized sheets	15,569	41,393	24,383
Other coated plates and sheets	1,098	2,095	2,851
Railway and tramway construction material	23,959	59,822	61,975
Wire rods	2,726	7,647	3,802
Wire	7,820	17,259	11,224
Tubes, pipes, and fittings	56,186	145,501	148,311
Iron castings	1,274	3,248	579
Steel castings	359	1,262	776
Forgings	312	972	1,359
TOTAL	213,142	549,043	520,120

LLANGUNNOR LEAD MINE, near Carmarthen, which has been closed for 100 years, has been reopened by Easton Bros., metal merchants, of Swansea, for the production of mineral barytes, which are used in the manufacture of paint and chemicals. At present the mine produces about 10 tons of high-grade barytes a week, but soon output will be stepped up to 30 tons a week.

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SHELL MOULDING with the new HIGH OUTPUT

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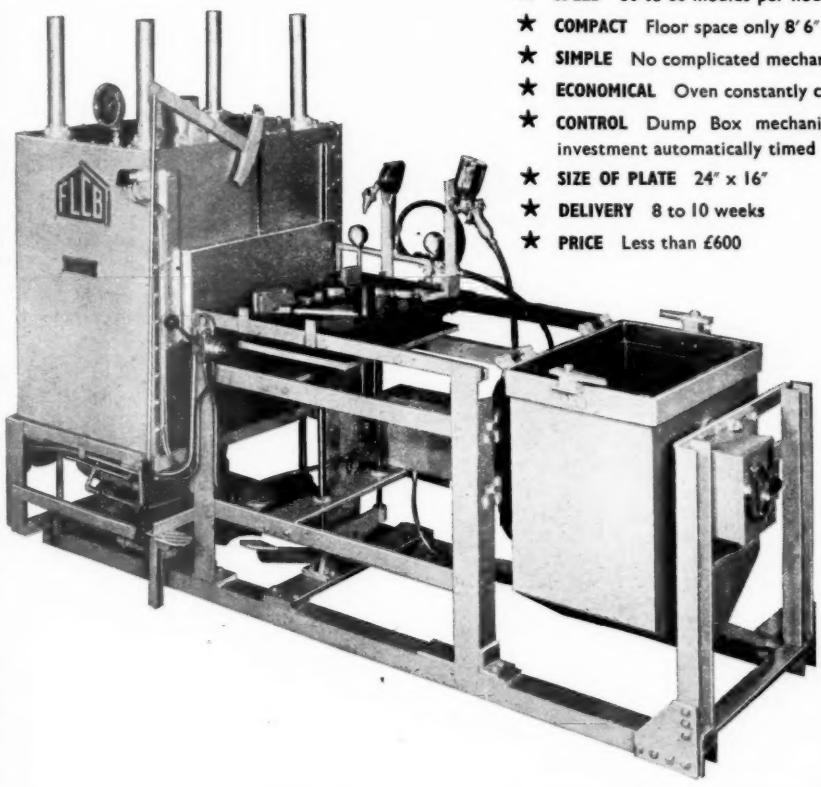
(PATENT APPLIED FOR)



- ★ **SPEED** 50 to 60 moulds per hour
- ★ **COMPACT** Floor space only 8′ 6″ x 3′ 3″
- ★ **SIMPLE** No complicated mechanisms to go wrong
- ★ **ECONOMICAL** Oven constantly curing
- ★ **CONTROL** Dump Box mechanically operated and investment automatically timed
- ★ **SIZE OF PLATE** 24″ x 16″
- ★ **DELIVERY** 8 to 10 weeks
- ★ **PRICE** Less than £600

A development of the "Shelmolda Senior" and "Junior" models, the "Shelmolda Duplus" brings high speed moulding and the advantages of automatic control by an unskilled operator, to the smallest foundry. To suit the requirements of individual foundries, the "Senior" and "Junior" models will still be available.

SHELMOLDA — Originated and manufactured by

FAIRBAIRN LAWSON COMBE BARBOUR LTD.

LEEDS, ENGLAND

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⊗ 236/57

Raw Material Markets

Iron and Steel

There is little change in the general pattern of business among the foundries. The engineering and speciality foundries maintain a steady rate of employment, and are much more favourably engaged than many of the light, jobbing, and textile foundries, which need many more orders to bring production near to capacity levels.

Pig-iron supplies, in the main, are keeping the foundries provided sufficiently for current needs, the only real shortage being in the low- and medium-phosphorus irons. Hematite is in better supply, and the makers of high-phosphorus irons are now able to clear off some of their arrears. While orders now being placed for this grade show some decline, producers have sufficient specifications on hand to cover current outputs.

Dearer coke for both the foundries and the blast furnaces is the cause of much concern. It is expected that there will now be a revision of pig-iron prices. Some of the recent increases in costs have been absorbed in the price of castings—in fact, this has been found necessary in order to quote competitively—but the further advances which are now being made will, it is feared, enforce an increase in prices, which will further reduce the foundries' chances of obtaining business.

Export business is subject to keen competition and the foundries fear that home trade will also suffer. Higher prices may result in reduced buying of such articles as refrigerators, washers, cookers, and other domestic equipment for which the light foundries supply castings.

The summer allocations of foundry and furnace heating coke have been issued and cover requirements from May 3 to October 30. The tonnages allow for summer consumption requirements and end-summer stock levels equivalent to six weeks' winter consumption for furnace coke and four weeks for foundry coke.

Scrap supplies can be secured fairly easily, and ganister, limestone, and firebricks are coming forward regularly to requirements.

The English and Welsh makers of billets are well able to look after the moderate needs of the re-rolling trade, so that there is no necessity for the import of billets. While the home trade for small bars and light sections is at a fair level, requirements are nothing like sufficient to keep the re-rollers and the light mills of the steelworks fully occupied. Demand for plates and sheets is upheld, and the steelworks manage to keep their heavy-section mills fully engaged.

Non-ferrous Metals

A revised zinc futures contract, which will be introduced on the London Metal Exchange for deliveries on and after September 1 next, is in line with the new contract for lead, introduced in February, and provides for trading in the first and second half of each month. Dealings in the first half of September commence on May 31. The purpose of the new contract is to speed up deliveries.

Steady conditions have prevailed in the non-ferrous metal markets, but the easy tendency which was discernible some weeks ago seems to have evaporated completely. This is hardly surprising against the background of the present international situation; uncertainty is rife and the outlook most disturbing. In view of the conflict in the Far East, tin has been the metal most affected, and although last week it showed a £10 drop in the cash price, there is, nevertheless, a strong undertone to trading in this metal. The forward quotation dropped by £7, and at the close of business on Friday the backwardation had been reduced to no more than £3. Throughout the week the turnover was quite good.

Copper also was active and here the feature was the shrinking of the backwardation to only £5 5s., continuing the process of reduction in the margin between cash and three months which has been going on for some time. Last week saw a fall of £1 15s. in cash and a rise of £1 5s. in three months. Wire bars continue to be delivered on the market. Lead was inactive and dull, one session going by without the transaction of any business. On balance, May put on 10s., while August gained 12s. 6d. A feature in zinc was the widening of the backwardation to 15s. from only 5s. a week before. May closed 15s. up, while August gained only 5s.

Generally speaking, the demand for non-ferrous semis is well maintained, and there seems now to be rather more confidence in the price structure, although users are not yet disposed to look far ahead. However, the somewhat hysterical insistence upon prompt delivery, which has been characteristic of the months following the opening of the copper market, has given place to a saner appraisement of the situation. After all, output has been materially reduced in the United States, and although the curve of copper production in the copper-belt is no doubt upwards for the long term, present difficulties such as the ever-recurring shortage of fuel, labour troubles, and so on, tend to keep the rate of increase down. So far as can be seen, there is certainly no accumulation of stocks in Northern Rhodesia at present.

Official metal prices were as follow:—

COPPER, Standard—*Cash*: May 6, £244 to £244 10s.; May 7, £243 10s. to £243 15s.; May 10, £244 to £245; May 11, £243 15s. to £244; May 12, £241 to £242.

Three Months—May 6, £237 15s. to £238; May 7, £238 to £238 5s.; May 10, £238 10s. to £238 15s.; May 11, £238 15s. to £239 5s.; May 12, £236 10s. to £237 10s.

TIN, Standard—*Cash:* May 6, £710 to £712 10s.; May 7, £715 to £716; May 10, £716 to £717 10s.; May 11, £718 to £720; May 12, £718 to £720.

Three Months—May 6, £710 to £712 10s.; May 7, £712 10s. to £715; May 10, £715 to £717 10s.; May 11, £715 to £717 10s.; May 12, £717 10s. to £718 10s.

ZINC—*May:* May 6, £79 15s. to £79 17s. 6d.; May 7, £79 10s. to £79 15s.; May 10, £80 to £80 5s.; May 11, £80 7s. 6d. to £80 12s. 6d.; May 12, £79 15s. to £80.

August—May 6, £79 to £79 5s.; May 7, £79 to £79 5s.; May 10, £79 5s. to £79 10s.; May 11, £79 10s. to £79 15s.; May 12, £79 to £79 5s.

LEAD—*May:* May 6, £93 5s. to £93 10s.; May 7, £93 10s. to £93 15s.; May 10, £94 to £94 10s.; May 11, £95 to £95 5s.; May 12, £93 15s. to £94.

First half August—May 6, £91 5s. to £91 10s.; May 7, £91 10s. to £91 15s.; May 10, £92 5s. to £92 10s.; May 11, £93 to £93 5s.; May 12, £92 5s. to £92 10s.

A.B.B.F.; New Officers

At the eleventh annual meeting of the Association of Bronze & Brass Founders held in London, yesterday, over which Mr. W. R. Marsland presided, Mr. A. F. Raynor (Anti-Attrition Metal Company Limited) was elected president and Mr. W. T. Hobkirk (J. Hobkirk Sons & Company Limited) vice-president.